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ANNUAL REPORT

OF THE

OHIO ACADEMY OF SCIENCE

Forty-third Meeting

1933

Organized 1891 Incorporated 1892

Affiliated with the American Association for the Advancement of Science

PUBLICATION COMMITTEE

F. O. GROVER J. ERNEST CARMAN S. W. WILLIAMS

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Botany: Orville T. Wilson
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Geography: Roderick Peattie
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Elective: *R. A.* Budington, James P. Porter

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W. E. Stout, term expires....1934
J. Ernest Carman, term expires....1935
E. L. Wickliff, term expires....1935
Roscoe W. Franks, term expires....1935
H. C. Sampson, term expires....1936
Edmund Secrest, term expires....1936
Emery R. Hayhurst, term expires....1936

Academy Representatives on the Joint Administrative Board, Ohio Journal of Science
C. G. Shatzer, term expires....1934
Edward L. Rice, term expires....1935

Academy Representatives on the Save Outdoor Ohio Council
Herbert Osborn, term expires....1934
E. N. Transeau, term expires....1934

Nominating Committee for 1934

Walter C. Kraatz
Bernard S. Meyer
Karl Ver Steeg
Fred A. Hitchcock
Louis D. Hartson
A. A. Atkinson
George D. Hubbard
William Lloyd Evans

REPORT OF THE FORTY-THIRD ANNUAL MEETING OF THE OHIO ACADEMY OF SCIENCE.

WILLIAM H. ALEXANDER,
Secretary.

Introductory.

The Forty-third Annual Meeting of The Ohio Academy of Science was held on April 13, 14 and 15, 1933, on the charming campus of Ohio's oldest university, namely, Ohio University, at Athens. This was the first meeting of the Academy in these historic walls and from the large attendance (356 in addition to those who forgot to register!) the selection was obviously a happy one and from the expressions of those present it is safe to say it will not be the fault of the Academy if another annual meeting is not held at this historic center within the next few years. The local executive committee, under the able and enthusiastic leadership of Dr. James P. Porter, did everything possible, it seemed, to amply provide for the needs of all. Two field trips to local points of interest were arranged; one to the Hocking County Park area, of interest to the members of the Sections of Geology and Geography, and the other to the Carbondale Coal Company's coniferous trees reforestation project, of special interest to entomologists and botanists. Ample provision was also made for the entertainment of the lady visitors.

Under the inspiration and able leadership of Dr. William Lloyd Evans, of Ohio State University, the efforts of the new Section of Chemistry to put on an attractive program were notably successful and the response of the chemists of the State enthusiastic, there being an attendance of more than one hundred at the first meeting of the section.

In addition to the large number of State institutions represented on the various sectional programs it is noted with pleasure distinguished representatives from the following institutions outside of the State were present and took part on the program: *University of Virginia, University of Chicago, University of Buffalo, University of New Hampshire,* and *Harvard University.*

The Annual Dinner on Friday evening (April 14) was, as usual, a most delightful affair, the only matter of serious regret being the demand for reservations exceeded the capacity (227) of the hotel banquet hall and so quite a number of late-comers had to be disappointed. Dr. James P. Porter served most acceptably as toastmaster on this happy occasion and the following program prepared by the local committee was put on immediately after the dinner:

Words of Greeting.....PRESIDENT E. B. BRYAN, Ohio University
"Onaway, Awake Beloved," (from Hiawatha).....*Coleridge-Taylor*
PHILIP PETERSON, Tenor
PRESIDENTIAL ADDRESS—"The Innocence and Guilt of Science,"
R. A. BUDINGTON, Professor of Zoology, Oberlin College
"Surely the Time for Making Songs Has Come".....*Rogers*
"My Lover Comes A-riding".....*De Leath*
MISS HELEN HEDDEN
"Weather and Other Predictions,"
W. H. ALEXANDER, Secretary of the Academy;
U. S. Weather Bureau, Columbus, Ohio
SOCIAL HOUR

MINUTES OF THE BUSINESS MEETINGS.

(Stenographically Reported.)

First Session: April 14, 1933.

The first business session was called to order by President Budington at 9:08 A. M., in Memorial Auditorium, with a quorum present.

PRESIDENT: The first item of business is the announcement of committees. This is rather difficult because we are not sure just who is here. Dr. J. Paul Visscher, Chairman of the Committee on Membership, will report tomorrow morning. On this committee with Dr. Visscher are Professors Van Cleef and Hibbard. On the Committee on Resolutions are Professors F. C. Blake, E. L. Rice and H. C. Sampson. It seemed at first that the Committee on Necrology would have no special report, but now we learn of two deaths during the past year—Dr. E. B. Williamson and Dr. E. N. Clarkson. I am appointing on that committee Dr. R. C. Osburn, of Ohio State University, and Professor Otis, of Western Reserve.

The Secretary's report was then called for, read, formally approved and ordered filed.

The Treasurer's report was next called for. The Treasurer, A. E. Waller, prefaced the reading of his report by the statement that all bills had been taken care of up to this year and suggested further that the financial affairs of the Academy could probably be more effectively handled if the fiscal year were made to harmonize with that of the *Journal;* that is, be made the calendar year. The Treasurer's report, together with a review or audit of the report by an accountant, was then read.

Discussion.

PROF. F. C. WAITE: The purpose of our Auditing Committee is to check the Treasurer's accounts that someone besides the Treasurer may know just what the situation is and that errors may be checked. It is not a question of honesty or dishonesty. What has been done is that they have selected two men. But those men are not auditors, and the result is not an accountant's audit. It seems best to me that the matter should go on a plan of having a competent accountant do it.

Furthermore, the Journal, with whom we have business, and the American Association for the Advancement of Science, with whom we have business, both use the calendar year for their fiscal year, while we do not. It would seem to be desirable that our fiscal year should correspond with theirs. I would offer the following motion to change the by-laws. It is an amendment to the by-laws to replace *Section 3, Chapter V, on Audit,* as follows:

"The fiscal year of the Academy shall be coincident with the calendar year. It shall be the duty of the Executive Committee to secure an audit of all financial accounts by a competent accountant, who shall report to the Executive Committee before the annual meeting."

This report will save some time at the annual meeting. I move its adoption.

PROF. WALLER: I second the motion.

PRESIDENT: We really have two things in front of us now. This is really an item of new business for which we have a specific place on our program. You have heard the motion and its second. Perhaps, in order that we may finish one part of business before we begin on another, we should finish the Treasurer's report.

PROF. F. C. WAITE: Mr. Chairman, I brought this motion forward that it might go immediately into effect—that the report might be referred immediately to the Executive Committee instead of the Audit Committee.

PRESIDENT: Are there comments on this motion to amend?

PROF. STICKNEY: Are we competent to amend the by-laws?

SECRETARY: We are.

PRESIDENT: Are there other remarks to make along this line?

Motion carried.

PROF. F. C. WAITE: I now wish to offer a resolution to bring this amendment into effect. There are two parts to the resolution as follows: First, that for the year 1933, the fiscal year will be from April 1 to December 31; second, that this By-law immediately takes precedence over any present By-law with which it conflicts.

PROF. WALLER: I second the motion.

PRESIDENT: The motion before us is that the period from April 1 to December 31 shall be carried as a special item.

Motion was approved.

PRESIDENT: This disposes of the election by the Academy of an Auditing Committee, such election being now unnecessary.

PROF. E. L. MOSELEY: Should there be a motion for the acceptance of the present report?

PRESIDENT: This brings the amendment into effect immediately, instead of waiting for a year. The next item is Item b, Section 4 of our program.

SECRETARY: We have been following the practice of making the Vice-Presidents of the current year the Nominating Committee for the next year. If the Academy wishes to continue this practice the only motion necessary is one to instruct the Secretary to cast a written ballot for the current Vice-Presidents.

PROF. F. C. WAITE: I move to instruct the Secretary to cast a written ballot for the Vice-Presidents, as listed on the cover of the term program, to be the members of the Nominating Committee at the next annual meeting.

A second to the motion followed; also request for comments by the President. Motion was approved.

SECRETARY: I am pleased to cast a written ballot for the following persons to serve as a Nominating Committee for 1934, viz.:

WALTER C. KRAATZ.....*Zoology*
BERNARD S. MEYER.....*Botany*
KARL VER STEEG.....*Geology*
FRED A. HITCHCOCK.....*Medical Sciences*
LOUIS D. HARTSON.....*Psychology*
A. A. ATKINSON.....*Physics and Astronomy*
GEORGE D. HUBBARD.....*Geography*
WILLIAM LLOYD EVANS.....*Chemistry*

PRESIDENT: The next item is new business. Is there any new business which anyone has in mind?

PROF. LINDSEY: Because of the impossibility of each of us caring adequately for our valuable collections, it occurred to me, without having had an opportunity to discuss the matter with other interested men, that we might very well consider for the benefit of science in the State the centralization or consolidation of collections to the extent that it may be feasible. Dr. Osborn, who is here, knows more about this than I. I would, however, move the appointment of a committee of three to consider this question of consolidation under state support of the important collections of the State. This should be an economic measure, and it should make it possible for us to maintain centralized collections of our valuable things.

PRESIDENT: Are there comments to make in connection with this move? Professor Osborn, does this appeal to you?

PROF. OSBORN: I think I could second the motion. I don't know, of course, just how it would work out, but it seems a good arrangement, and I second the motion.

PRESIDENT: I wonder whether, since our time is short and our membership here in this meeting is small, we may not take Professor Lindsey's suggestion under consideration and talk it over among ourselves during the day, and then bring the thing up for final action tomorrow when there will be more of us here and when we can handle it a little more intelligently. We may bring this up under unfinished business tomorrow morning.

Is there other new business?

DR. PORTER: The suggestion has been made that after the adjournment of the business session we meet on the steps of the auditorium and have our pictures taken.

PRESIDENT: The group is very small.

DR. PORTER: Quality counts rather than quantity.

PRESIDENT: Does anyone here know whether Prof. Kendeigh has arrived? If there is only one address to be given in our next session, we should have time for the picture.

The President then declared a short recess and members assembled on the front steps of the auditorium where a photographer was in waiting. After the photograph had been made, the members reassembled in the auditorium and the business session was resumed.

The report of the Executive Committee was called for by the President and was read by the Secretary.

PRESIDENT: You have heard the Secretary's account of such business as the Executive Committee has carried out this year. Are there questions or comments? If not, what is your pleasure with reference to this report?

Report formally accepted and ordered filed.

PRESIDENT: The hour when our address in general session should begin is very near at hand. As it happens, we are much disappointed in not having Mr. Bennett with us for his part in this session. A telegram yesterday informed us that he was so engaged with affairs in Washington that he could not come up here. The consequence is that we do have a little more time than we might have otherwise had, but it will still be full. What shall we do with reference to the remaining reports? Can we postpone them until tomorrow?

SECRETARY: I think so, Mr. President.

Meeting adjourned.

Immediately following the adjournment of the First Business Session on Friday, April 14th, the first and only General Scientific Session of the Academy was called to order by the President in Memorial Auditorium at 10:10 A. M. As announced by the President, word had been received that Mr. H. H. Bennett, of Washington, D. C., had been unavoidably detained and could not be present for his address, much to the disappointment of the Academy.*

*However, Mr. Bennett supplied a copy of the address he would have given had he been present and same is published elsewhere in these Proceedings.
—W. H. A.

Accordingly the President introduced Dr. F. C. Waite, of Western Reserve University, who gave a most interesting illustrated lecture on "The Early History of the Microscope."

This was followed by a most interesting lecture, also illustrated, on "Toleration of Low and High Air Temperatures by Birds," by Dr. S. Charles Kendeigh, of the Baldwin Bird Research Laboratory and Western Reserve University, at Cleveland.

Second Session: April 15, 1933.

Meeting was called to order at 8:35 A. M.

PRESIDENT: The first item of business is item b, Section 6, of our program; report of the Publications Committee by Prof. E. L. Moseley.

Prof. Moseley's report was read and followed by the following suggestion in form of motion by Prof. Moseley: "That the Publications Committee be authorized to get an estimate of the cost of the publishing of the new edition of Lynds Jones' *Birds of Ohio* and the decision as to publication be referred to the Executive Committee in conjunction with the Publications Committee."

Motion was seconded and carried.

Report of Trustees of the Research Fund was made by Prof. Herbert Osborn.

PRESIDENT: According to the step which was taken yesterday morning, this financial statement will be passed upon by a competent accountant and the accountant's report passed to the incoming Executive Committee, who will then handle it and consider the account audited properly. This really means, of course, that we are putting into operation the plan of having all Academy accounts audited by an accountant rather than by two or three of our semi-ignorant members. We are going to put all our funds into such form and handle them in that way. It seems as if this is the only business-like way of taking care of our finances. Since this motion was passed yesterday morning, I assume there is nothing further for us in the Academy to do. Is there a report as to grants which were made from the Research Fund for the year, Mr. Osborn?

PROFESSOR OSBORN: No expenditures were made. Other

members think it advisable to let the fund accumulate rather than make grants this year.

PRESIDENT: Whatever may seem best to be done will be decided by the committee on this Fund when the communication goes to them. Does someone move this report be accepted?

Motion made, seconded, and report accepted.

PRESIDENT: The next report is from the Library Committee by Mrs. Ethel M. Miller.

Mrs. Miller read her report and offered a suggestion that members, each of whom had been sent two publications from the Ohio Biological Survey, return the copies if they did not care for them.

PRESIDENT: You have heard the carefully prepared report of Mrs. Miller. Are there questions or remarks? Mrs. Miller has already submitted to the Executive Committee a full financial statement of the funds and expenditures which she has just reviewed. This will be submitted to a professional accountant and then formally accepted by the Executive Committee.

Motion made, seconded, and carried that report be accepted.

PRESIDENT: The next report is from Prof. Osborn again for the Committee on State Parks and Conservation.

Following this report, motion was made, seconded, and carried that it be accepted.

PRESIDENT: We now come to reports of the Special Committees. We will listen to a report on the Election of Fellows by the Secretary.

SECRETARY: After two years' trial, I have the rather settled conviction—and I think this feeling is very largely shared by the present committee—that the 60-day limit for filing the nominations to fellowship is somewhat too long and for that reason the committee decided at its meeting last evening to ask the Academy to amend the rule by making it 30 days instead of 60.

PRESIDENT: The suggestion accomplished this: That the preliminary notice which calls your attention to the nomination of Fellows should be sent out forty-five days before the annual meeting, giving each two weeks to send in nominations. The trouble now is that they practically never come in sixty days ahead, and the probability is that any special requirement will be waived, because otherwise there would be no elections

to be made, but it seems if it is reduced to thirty days, we might be able to stick to it. That would be wholly reasonable. Perhaps sixty days is reasonable too, but it doesn't seem to be working well.

PROF. DELONG: I do not deem the present system of electing members to the Fellowship to be fair and therefore suggest that a special Fellowship Committee be set for the purpose of canvassing the whole membership in an attempt to choose those members who may be eligible and ought to be chosen.

PROF. TASHIRO: Instead of the thirty-day limit for the filing of nominations as suggested by the Committee on the Election of Fellows, why not set a certain line of demarcation, as, for instance, March 10?

PRESIDENT: One difficulty with that would be, I think, that we have to regulate, to a certain degree, the date of our meeting according to the convenience of our host.

PROF. TASHIRO: That would make no difference; just make it one date, no matter when the meeting comes.

PRESIDENT: Under some circumstances, though, you would only have twenty days, and under others you would have forty, depending upon the relation of the date of the meeting and March 10, which you suggest.

DR. MOSELEY: Sometimes our meetings come within the month of March.

PROF. R. C. OSBURN: How far ahead of time is the first announcement prepared and distributed?

PRESIDENT: The suggestion last night was forty-five days ahead.

PROF. R. C. OSBURN: The date in the announcement would be definitely set so that we would know that nominations would have to be by a certain date.

DR. DELONG: I am willing to make a motion that a Fellowship Committee be appointed to nominate all the Fellows who are eligible.

DR. ENGLISH: It would be preferable if each section were instructed to set up for itself a Fellowship Committee, which Committee should have a certain degree of preference and be charged with an annual survey of the section to determine which of its members should become Fellows. I don't see how any person could hope to be familiar enough with two or three interests represented in the Academy, and with the personnel

of the Academy, to enable him to say, by merely seeing a name, whether that person should be a Fellow. I should like to ask Dr. DeLong to substitute this clause in his motion.

DR. DELONG: My idea is that there should be a centralized committee.

PRESIDENT: The Secretary reminds me that that is in effect the situation now.

DR. F. C. WAITE: The present plan of having the Vice-Presidents, ex-officio, act as the Nominating Committee rests on the presumption that they are acquainted with the members of their own sections; that they make the best Committee there is; that they are acting with their own sections and know more about the members in their own sections than any other one person. If you set up another committee, it simply makes *another committee*, and the difficulty of getting members on that committee who will work together is great.

Another thing; this thing of going out and trying to canvass someone who might possibly be made a Fellow is not the right attitude. Fellowship is supposed to be an attribute to outstanding work. This question of trying to make everybody a Fellow decreases the worth of the Fellowship. Often there have been proposals that certain members be solicited for Fellowship who are not eligible. It is embarrassing to have to turn them down after they have been recommended like that. We all know that every additional committee is simply a problem in finding men to serve on it.

PROF. E. L. RICE: I would like to raise the question whether the Academy is agreed whether it is worth while to have a Fellowship at all. As I am a fellow myself, I don't hesitate to make the suggestion that it be discontinued.

DR. DELONG: There are those in our group who are autocrats and desire class distinction. I am not one of these. I do not agree with Dr. Waite's view.

PROF. SMITH: We haven't made a recommendation on Dr. Alexander's suggestion. I move its approval.

Motion seconded and carried.

A MEMBER:* Is it true that the Committee does not have power to nominate Fellows unless the nomination is placed with them? If we give that Committee power to make decisions themselves, it might relieve the situation.

*Name not caught by the stenographer.

THE SECRETARY: Mr. President, may I suggest in reply to the question just asked by the gentleman that the members of the Committee on the Election of Fellows *as individual members*, like any other members, have the right to submit nominations but it would be manifestly farcical for the Committee as a whole to make nominations and then sit in judgment on their fitness. You understand the Academy as a whole has nothing whatever to do with the election of fellows; that duty by constitutional provision is imposed upon this committee. Its action is final.

PRESIDENT: I think they have that privilege as individuals. If no one objects, the next item of business will be the report of the Committee on Memberships by Prof. Visscher.

After the report, a motion was made, seconded, and carried, that the applicants mentioned be elected to membership.

PRESIDENT: The next item is the report on Necrology by Professor Raymond Osburn.

Report read by Professor Osburn.

PRESIDENT: We regret to hear so many names included in this report. What shall we do with this report?

Motion made, seconded, and carried, that it be accepted and filed.

PRESIDENT: The next report comes from representatives on the Joint Administration Board of the Ohio Journal of Science.

In the absence of Dr. Meyer, Chairman of the Board, the report is read by Dr. Rice.

Motion made, seconded and carried that the report be accepted and placed on file.

DISCUSSION.

PROF. RICE: Does that acceptance carry those two recommendations included in that report? Also, does that make official the arrangements we made last year? We can find no record of any adoption of that report other than the printing was carried out. I assume that the acceptance of this report covers both those points.

PROF. ENGLISH: I would like to raise an issue at this point of the relationship of the Academy to the Journal. One dollar and fifty cents of our dues go to the Journal and 50 cents for the cost of the Proceedings. That means the Academy is run on about 50 cents a year aside from the Proceedings and Journal. The Journal is predominantly a Journal of Biological

Science. It probably should be continued as such. I am not raising the question, in any sense, critical of the editorial policy. At the same time, such a Journal inadequately serves the wide variety of interests represented in the Academy. It is true that members should have a general interest in science, and many are receiving other science publications, but, even so, $2.50 does amount to something. A few of our distinguished members have withdrawn because they did not feel they could meet the dues. Now, if the Academy should subsidize the Ohio Journal, I think we should do it on a flat rate; and I question whether we should automatically tax all the members of the Academy for a Journal which, for most of them is not read—or, I should say, many of them—or needed. I move as an amendment that hereafter the Journal be optional to members of the Academy and that dues be reduced to $1.00 a year for those who do not receive the Journal, such members to receive a copy of the annual transactions. That still leaves 50 cents for each member as a tax for subsidy of the Journal, a journal which he doesn't receive; but it is important that the Ohio Journal be continued, and such a subsidy as that might be tolerated.

PRESIDENT: Are there further comments to make?

PROF. RICE: Mr. President, I think it rather unfortunate that I should have brought up that technicality that we had no record of the action we discussed last year. What the effect of a cut like that proposed would have on the Journal, is hard to tell. It would at least curtail its size. It would throw the Journal in a state of chaos. As regards the use of the Journal by different sections of the Academy, the Editor was expressing only the other day his desire and ambition to make this Journal of interest to others. The fact that it has been almost purely biological is because no other papers have been submitted for printing.

PROF. SEYMOUR: It is undoubtedly true, as interested as I am in biological science, I frequently find a Journal which contains little of interest. On the other hand, I often find a Journal which is all interesting. Our exchange list is of major interest to every member. If the Journal should be discontinued, our whole exchange list would be wiped out.

PROF. SNYDER: As Editor, I would like to say that we now have many sections in addition to biology. Any article which

we have received other than biological articles, has been printed immediately. I should dislike to see the Journal curtailed. In fact, it is already curtailed. An Academy cut would justify the University in also making a cut.

I think the desirable thing would be to make the Journal available to every section if we can get people to see that articles come in to us. We should be only too glad to publish papers for other sections, as we have, to some extent, during the past year.

DR. F. C. BLAKE: I want to explain why there aren't any physics papers being published. I appreciate the idea of Dr. English. The American Institute of Physics is publishing eight or nine Journals, and that provides us a complete method of publication. Our laboratory work is of a national character, and there is no particular reason for our publishing our papers other than nationally. I have had a policy of turning my Journal back to Mrs. Miller. Others are doing the same thing. We cannot expect to be publishing in the Journal of Science much because of our national outlet, for the reason I have just stated; but, nevertheless, we are heartily in sympathy with the enlargement of the Journal, and I shall do what I can to see that we get a section editor that will deliver more physics papers.

DR. WAITE: I consider this debate out of order. The real question is concerning the report of Dr. Rice.

PRESIDENT: As a matter of fact, I think we voted on the report of Dr. Rice. It was accepted. It was after it was passed that this question came up. We now have before us, of course, the motion of Prof. English. It has been seconded and comments on his motion have been advanced.

I think Prof. Rice has pointed out the seriousness of taking a step of this kind until we really know more of what the consequences would be. I don't think we are familiar enough with the matter to see just what this would mean. It strikes me that it is a legitimate question, and we are not prepared at this session to vote very intelligently upon it. The management of the Journal should be consulted as to what such a move would mean. We are all interested in the Journal to some extent and would not want to handicap it too far.

PROF. BURT: I think it would be unfortunate, perhaps, to take ill-considered action on this at this time, although,

personally, I am somewhat in favor of the proposition. I should like to move this matter be referred to the Executive Committee to canvass the members before the next meeting as to their opinions on the subject, and to go over it with the Publications Committee; that the whole thing be referred to the next annual meeting.

DR. WAITE: I think the Publications Committee should consult with the Executive Committee on this.

DR. ENGLISH: I agree to Prof. Burt's suggestion and wish to assure Dr. Waite that my reason for bringing this matter up at this time is that the acceptance of Dr. Rice's report did not carry with it the continuance of the policy which has been adopted by the Academy from year to year, and I therefore deemed the time appropriate to bring up the matter; I certainly do not wish to have the matter taken as a snap judgment; I believe every member should be canvassed concerning it. I withdraw my motion with consent of the second.

PRESIDENT: I understand that the first motion which was made by Prof. English has been withdrawn, and in place of it we have before us the motion which was made by Prof. Burt with reference to referring this to the Executive Committee and the Joint Administrative Board of the Ohio Journal of Science for investigation, including a canvass of the membership and report at the next annual meeting.

Doctor Rice then raised the question as to just what Committee was referred to, and it was ascertained that the committee meant was the Committee representing the Academy on the Administrative Board of the Journal of Science.

Motion carried.

PRESIDENT: The next report is on the Save Outdoor Ohio Council, to be given by Prof. Herbert Osborn in the absence of Prof. Waller.

Report read, formally accepted and placed on file.

Following the reading of this report pamphlets concerning conservation of forests, land, wild life, etc., were distributed by Dr. F. H. Krecker.

PRESIDENT: The report of the Nominating Committee will be made by Dr. DeLong.

President called for further nominations in addition to those read by Dr. DeLong. Motion was made, seconded, and

carried, that the Secretary cast a unanimous ballot for the list mentioned in the report.

PRESIDENT: The next thing is unfinished business. One matter left over from yesterday was Dr. Lindsey's motion to establish a central collection.

Dr. Lindsey withdrew motion because of lack of time.

The President called for other business. Report was then read by Dr. Baird on publication of work for junior scientists. Further discussion of the matter was referred to the Executive Committee by unanimous agreement.

PRESIDENT: We are now ready for the report of the Committee on Resolutions by Prof. Blake.

Report was read by Dr. Blake and unanimously approved.

PRESIDENT: Does someone wish to make a motion that the question of the place and time for the next meeting be referred to the Executive Committee?

Motion made, seconded and carried.

SECRETARY: The question of electing an Academy representative on the Council of the American Association for the Advancement of Science and the Academy Conference, also a representative on the Save Outdoor Ohio Council, should also be referred to the Executive Committee.

Accordingly, the matter was referred by formal motion to the Executive Committee with power.

Meeting adjourned, *sine die*, at 10 A. M.

THE SCIENTIFIC SESSIONS.

GENERAL AND SECTIONAL.

The following is a complete list of the addresses and papers presented at the various general and sectional meetings of the Academy as reported to the Secretary:

1. THE PRESIDENTIAL ADDRESS: The Innocence and Guilt of Science, R. A. BUDINGTON
2. Architecture in Ohio.....F. J. ROOS
3. The Cost of Soil Erosion (by title).....H. H. BENNETT
4. The Early History of the Microscope.....F. C. WAITE
5. Toleration of Low and High Temperatures by Birds..S. CHARLES KENDEIGH
6. Germ-cells and Early Development of Arbacia as Affected by Aspirin, R. A. BUDINGTON
7. Further Studies of the Nature of the Golgi Apparatus Leading to a Discontinuance of the Use of the Term.....HOPE HIBBARD

8. Growth and Yolk Formation in the Parthenogenetic Eggs of *Daphnia magna*.....HYMAN LUMER
9. Antennal Regeneration of *Daphnia magna*.....B. G. ANDERSON
10. Migrations and Aggregations of Paramecia in Response to pH, Carbon dioxide, and Oxygen.....EDGAR P. JONES
11. Further Studies on the Behavior of Barnacle Larvae.....J. PAUL VISSCHER
12. Organisms Found in 30 c. c. of Material Collected from a Quarry Depression on Kelley's Island, August, 1932.....STEPHEN R. WILLIAMS
13. Are Natural Mutations Random Occurrences?.....WARREN P. SPENCER
14. Some Observations on the Stability of Mutations.....ROBERT A. HEFNER
15. Studies on the Common Checkered Skipper.....A. W. LINDSEY
16. Ecological Studies of *Argia moesta* Hagen (Odonata: Coenagrionidae) by Means of Marking.....DONALD J. BORROR
17. A Study of the Gross Anatomy of the Brain of the Garpike, *Lepisosteus osseus*.....TOMAS VAN SICKLE (Read by WALTER C. KRAATZ)
18. Parasites of the Spotted Bass, *Micropterus pseudaplites* Hubbs., RALPH V. BANGHAM
19. The Relative Infestation of Birds by Mallophaga.....ROBERT M. GEIST
20. Avian Tuberculosis in the Eastern Song Sparrow.....LOUIS B. KALTER
21. Fall and Winter Behavior of Song Sparrows.....MRS. MARGARET M. NICE
22. The Red-bellied Water Snake, *Natrix sipedon erythrogaster* (Forster) in Ohio.....ROGER CONANT
23. An Experiment in Teaching Freshman Zoology without Required Dissection.....ARAVILLA M. TAYLOR
24. Some Field Notes and Junior Scientists.....ROBERT L. BAIRD
25. Introductory Remarks: Investigations in the Hydrobiology of Ohio, RAYMOND C. OSBURN
26. Hydrobiological Survey of the Western End of Lake Erie. An Account of the Work and Methods of the Survey Conducted by the Ohio Division of Conservation.....E. L. WICKLIFF
27. Summary of Limnological Investigations of Western Lake Erie in 1928, WILBUR M. TIDD
28. Summary of Limnological Investigations of Western Lake Erie in 1929 and 1930.....STILLMAN WRIGHT (read by E. L. WICKLIFF)
29. The Crustacea Used as Food by the Young Fishes in Lake Erie, LELA EWERS
30. Summary of Limnological Investigations of Buckeye Lake in 1930, E. L. WICKLIFF
31. The Invertebrate Shore Fauna of Western Lake Erie.....F. H. KRECKER
32. Preliminary Limnological Investigations of the Major Impounded Waters of Ohio.....LEE S. ROACH
33. The Ecology of an Intermittent Stream.....JAMES W. BRANSON
34. The General Effects of Pollution on Ohio Fish Life....MILTON B. TRAUTMAN
35. The Relation of Clumping to the Rate of Oxygen Consumption and Toxic Action of Salts in *Sparganophilus eiseni*, EMMETT ROWLES AND OSCAR TURNER
36. The Effect of Sedimentation on the Rate of Oxygen Consumption in Various Fishes.....P. S. SHURRAGER AND EMMETT ROWLES
37. A Study of the Insect Fauna of a Coniferous Reforestation Area in Southeastern Ohio.....GEORGE R. EASTERLING
38. Milo G. Williams, Botanist (1804–1880).....MARGARET B. CHURCH
39. Introducing the Ohio State University Botanic Garden.....A. E. WALLER
40. Light in Relation to the Germination of Certain Seeds.....JESSE D. DILLER
41. Hydrogen Ion Relations of Some Ohio Mosses.....GILFORD J. IKENBERRY
42. "Bound Water" in Relation to the Cold Resistance of Pitch Pine, BERNARD S. MEYER
43. A Unique Raised Bog at Urbana, Ohio.....ROBERT B. GORDON
44. Supernumerary Parts and Adnation in the Flower Parts of *Lycopersicum esculentum*.....LEON HAVIS
45. Duplicate Evolution of Peculiar Perianth Structures in the Sedges and Composites.....JOHN H. SCHAFFNER
46. Ericales of Western North America.....W. H. CAMP
47. The Algae of Oklahoma.....CLARENCE E. TAFT

48. Variations in Unicellular Algae.....Elbert H. Ahlstrom
49. The Vascular Flora of Ashtabula County, Ohio.....Lawrence E. Hicks
50. The Distribution of the Tulip Poplar in the Central States, Leonard F. Kellogg
51. Flora in Roof of Upper Freeport Coal at Callahan's Mine, Teegarden, Ohio.....Willard Berry
52. Further Study of the Drainage History in the Old Steubenville River Basin.....G. F. Lamb
53. Glacial Boundaries in Northeast-central Ohio.....George W. White
54. Re-excavated Valleys in Southern Ohio as a Proof of the Lowering of a Land Surface by Inter-stream Degradation.....John L. Rich
55. New Species from the Silica Shale of Lucas County, Ohio..Grace A. Stewart
56. An Extension of the Rock Unit Called Silica Shale.....J. Ernest Carman
57. Pre-Illinoian Sediments and Deep Soils on Bed-rock Near Cincinnati, Ohio.....Walter H. Bucher
58. The Relation of Soils to Geology in Adams County, Ohio.
    (a) In General.....G. W. Conrey and A. E. Taylor
    (b) In the Disturbed Area of Northern Adams County...John T. Miller
59. Announcement of Plans for the Annual Spring Field Trip...Karl Ver Steeg
60. The Role of Forest Cover in the Control of Erosion and Run-off, Edmund Secrest
61. Problems in Lower Mississippian Correlations.....Paris B. Stockdale
62. A Plan for Increasing Interest in Geology in Ohio.....Richard C. Lord
63. Preliminary Report on the Cambrian Limestone.....Robert H. Mitchell
64. Parker Straths Near Cincinnati.....Louis Desjardins
65. Buried Channels at Cincinnati as Revealed by Borings.....Otto Gutenson
66. Additional Evidence on the Physiographic Development of Straths and Post-strath Warping.....M. Meredith Sheets
67. The Micro-fauna of the Vanport Limestone in the Youngstown Region, Edgar L. Stephenson
68. A New Inter-glacial Deposit Near Oxford, Ohio.....J. J. Wolford
69. The Black Hand Formation in Knox County, Ohio.....Richard C. Lord
70. Sedimentation in Upper Cretaceous Sea of Utah.....Edmund M. Spieker
71. Paleozoic Formations in Virginia.....Arthur Bevan, State Geologist
72. The Upper Roanoke and Greenbriar Basins.....Frank J. Wright
73. The Physiography of Jehol, North China.....George B. Barbour
74. Devonian Shales of Eastern Kentucky.....Appalachian Geological Society
75. The Work of the Harrisburg Erosion Cycle.....Nevin M. Fenneman
76. Bone-beds and Associated Crinoidal Sands of the Delaware Linestone, Lewis Westgate and Richard P. Fischer
77. The Cow-Run Sandstone in East-Central Ohio.....C. F. Moses
78. Insoluble Residues of Niagaran of Southwestern Ohio.Richard A. Edwards
79. Late Crystallization in Resorbed Plagioclase Phenocrysts.....Harold Fisk
80. Recurrent Coral Faunas of the Ordovician.....W. G. Meyer
81. Truncation versus Peneplanation.....John L. Rich
82. Boulder Fields of the Northern Appalachians.....Karl Ver Steeg
83. Problems of Limestone Cave Origin. (Read by title)....A. C. Swinnerton

Symposium on Endocrinology.

84. The Effect of the Anterior Pituitary on the Composition of Growth, Dr. M. O. Lee, Harvard University
85. The Thyroid and the Iodine of the Blood.....Dr. George M. Curtis
86. The Functions of the Adrenal Cortex, Dr. Frank A. Hartman, The University of Buffalo
87. The Male Sex Hormone.....Dr. F. C. Koch, University of Chicago

Symposium on Blood Discrasias.

88. Hereditary Factors in Diseases of the Blood.....Dr. L. H. Snyder
89. Nutritional Anemia.....Dr. Ernest Scott
90. The Clinical Anemias.....Dr. George Nelson
91. The Problem of White Blood Cell Equilibrium.....Dr. C. A. Doan
92. A New Test to Measure Appreciation of Poetry.....Prof. Melvin Rigg
93. Profiles of Unsatisfactory College Students.....Prof. C. O. Mathews
94. Item Analysis: The Basis for Constructing a Test for Forecasting Supervisory Ability.....Dr. R. S. Uhrbrock

95. An Experiment in Selecting Test Items.....Miss Dorothy C. Adkins
96. Rivalry in Young Children.....Clarence J. Leuba
97. A Photographic Study of Emotional Facial Expressions in the Second Year of Infancy.....Horace Champney
98. The Influence of Organization by the Learner on Permanence of Learning.....H. B. English
99. The Influence of Surface and Tint of Paper on the Speed of Reading, Frank H. Stanton
100. Effect of Head Tilt upon Visual Localization in Horizontal Plane, Winford L. Sharp
101. Temporal Factors in the Formation of Conditioned Eyelid Reactions in Human Subjects.....Mr. Arthur Bernstein
102. The Influence of Rate and Direction of Change on Comparative Pitch Judgments.....Mr. William Schwarzbek
103. Some Observations on Learning and Relearning in the Hypnotic Trance vs. the Waking State.....Mr. M. K. Walsh
104. A Preliminary Report on the Fels Study of Fetal Movement, Dr. Robert F. Wallace
105. The Nature of Emotion and its Relation to Anti-Social Behavior, Mr. Fred Brown
106. Informal Reports Concerning Laboratory Work in Progress.
107. The Theory of Radio Field Intensity Measurements.....D. B. Green
108. The Design and Application of a Radio Field Intensity Meter, Russell V. Kelch
109. Neutrons in the Structure of the Nucleus.....A. Lande
110. History of the Neutron.....Homer C. Knauss
111. Fluoresence of Chlorophyll (b).....V. M. Albers and H. V. Knorr
112. Demonstration in Mechanical Resonance.....T. D. Philips
113. Crystal Structure of Lithium Sulfate.....John G. Albright
114. A Visual Modification of the Sonometer Experiment.....C. E. Howe
115. A Thermo-electrically Driven Pendulum.....John G. Albright
116. Rapid Computation of Energy Distribution in Black Body Radiation, Cedric E. Hesthal
117. A Symposium on Cultural Physics Courses.
    How Can We Make Our Physics Courses Have More Meaning for the Lay Student?.....R. J. Havighurst
    A. Cultural Physics Course at Ohio State University.....H. P. Knauss
    A Modification of the Traditional Approach to General Physics, L. W. Taylor
    The Physical Course at Antioch.....G. E. Owen
118. Calculation of X-Ray Scattering Coefficients as a Function of the Wave Length.....L. M. Heil
119. Additional X-Ray Absorption Coefficients Using the F-P-54 Pilotron, John E. Edwards
120. Some Common Errors in Physics Textbooks.....T. D. Philips
121. The Evolution of the Thermometer. (Demonstration).....Earl H. Brown
122. The Apparent Effects of Lake Erie on the Weather of Northern Ohio, Robert O. Brink
123. The Democartography of Ohio.....Guy-Harold Smith
124. Influence of Cincinnati on Agriculture.....W. R. McConnell
125. Yellow River.....George B. Barbour
126. The Geography of Italy's Recent Expansion.....Roderick Peattie
127. Negro Residential Occupance in the Chattanooga, Tennessee, District, Nathaniel C. Burhans
128. Soil Type as a Factor in Crop Distribution in Athens County, Ohio, G. W. Conrey and A. H. Paschall
129. The Use of Air Photographs in Geographical Studies in Ohio..G. W. Conrey
130. A Map Study of Ohio.....John H. Garland
131. Dayton: Geography of a Confluent Site.....Alfred J. Wright
132. Urban Location *versus* Accessibility.....Eugene Van Cleef
133. Reconnaissance Method in Urban Geography.....Margaret E. Stevens
134. Wellington, Ohio: A Rural Village.....Walter W. Ristow

135. The Application of the Dead Stop End Point to Titrations with Ceric Sulfate.....D. R. Clippinger and J. F. Corwin
136. A Student Problem in Electro-Analysis, Grover L. Orr and Kenneth L. Roberts
137. Quantitative Spectroscopic Estimation of the Metals, W. R. Brode and J. G. Steed
138. The Use of the Polarograph in Chemical Analysis.....Richard Bradfield
139. The Modern Barium Industry.....James R. Withrow
140. The Present Status of Municipal Water Softening.....C. P. Hoover
141. The Chemistry Courses in the Small College.....K. G. Busch
142. An Electrical Conductivity Apparatus for a Laboratory of General Chemistry.....J. E. Day and James K. Farrell
143. Interfacial Tension and the Phenomenon of Wetting.....Harry N. Holmes
144. The Solubility of Silver Oxide in Alkali and in Alkaline Salt Solutions and the Amphoteric Character of Silver Hydroxide, A. B. Garrett, F. Cuta and Herrick L. Johnston
145. Some Thermodynamic Properties of the Neutral OH Molecule Computed from its Spectra....David H. Dawson and Herrick L. Johnston
146. The Reductivity of Hydrogen. III. Ferric Sulfate.....Raymond Hood
147. Metal Salts of the Alcohols and Alcohol Analogues.....Otis Dermer
148. Studies on Protochlorophyll. Reduction of Pure Chlorophyll and of Pheophytin.....Paul Rothemund
149. An Alkali Stable Complex Carbohydrate from Aerobactic Aerogenes, Harold M. Whitacre and Harvey V. Moyer
150. New Syntheses in the Olefine Series.....Iman Schurman and C. E. Boord

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DEMONSTRATIONS AND EXHIBITS.

1. Limnological Equipment. (Various pieces of equipment used in quantitative plankton work, and other types of limnological investigations.) Exhibited by the Ohio Division of Conservation and Ohio University.
2. Modified Qualitative Plankton Tow Net with Bucket. Exhibited by Lee S. Roach, Uhrichsville High School.
3. Small Birge Closing Quantitative Plankton Tow Net. Exhibited by W. C. Kraatz, University of Akron.
4. Home-made Devises for Use in Mounting Sections. Exhibited by Emory S. James, Ohio Wesleyan University (introduced by Edward L. Rice).
5. A Method for Demonstrating Fruit Flies and Other Small Insects. Exhibited by Warren P. Spencer, College of Wooster.
6. An Exhibit of Certain Groups of Insects of Southeastern Ohio, including Collections of Orthoptera—Butterflies, Velvet Ants, Tiger Beetles, Lady Beetles, and a few rather uncommon Species of Various Other Groups. From the Biology Department, Ohio University, arranged under the direction of Mr. William C. Stehr, Assistant Professor of Biology, Ohio University.
7. The Evolution of the Thermometer, by Earl H. Brown, Antioch College.

REPORTS.

Report of the Secretary.

ATHENS, OHIO, April 14, 1933.

To the Ohio Academy of Science:

Your Secretary is pleased to submit herewith his tenth annual report, very briefly stated. These ten years have brought with them many inevitable changes and have left their marks in many places and on all our faces! Quite a number of those who gathered with us at the little meeting in Oberlin just ten years ago are no longer seen or heard among us! The Secretary recalls as if it were only yesterday the shock of surprise when his beloved and greatly admired friend, the late Dr. Thomas Corwin Mendenhall, as chairman of the Nominating Committee read out, "For Secretary, William H. Alexander, of Columbus!" My greatest ambition and inspiration have been during all these ten years to be worthy of the confidence placed in me by the Academy, with the knowledge and consent of that courtly gentleman and scholar! If he were in our midst this morning would he, could he, say, "Well done, good and faithful servant!" The continued confidence of old friends and the making of new ones constitute the chief reward for the onerous duties of the office.

Our membership for reasons known to all has suffered losses during the year now closing and the recruits have not fully replaced these. Most fatalities occurred at the gate called "Dues," so carefully guarded by a skillful, sharp-shooting Treasurer! As the casualties are not always promptly reported to the Secretary, the two lists are not in perfect agreement at all times. We will therefore await the report of the Treasurer as to the present membership list.

Probably the outstanding events of the year were, first, the sponsoring by the Executive Committee of the Academy of a series of radio talks on popular subjects by members of the Academy extending from January to April, inclusive, more fully noted in the report of the Executive Committee. (See Appendix B.) This effort, of course, imposed considerable work on the Secretary, but in view of the high aims and the ready, hearty response of members, the work was a pleasure. The second event of note was the organization of the *Section of Chemistry*. (See Appendix A.) In this the Secretary played a minor part to be sure, but to have even a very small part in a real event is some satisfaction.

Otherwise, the work of the Secretary has been almost wholly routine and there is neither time nor need for a recounting of monotonous details at this time.

We desire to commend most cordially the earnest and obviously successful efforts of the vice-presidents in searching out and securing such an array of talent for the sectional meetings, as shown on the printed program of this meeting. We believe the Academy was never more firmly established on the high road of useful and helpful service nor looked forward on a brighter future. We bespeak for it the loyal, enthusiastic work and support of every member.

Again, good friends, for your kindly, helpful thoughts, words and deeds, most hearty thanks. For our shortcomings we ask your indulgence, and for the future an encouraging smile!

Respectfully submitted,

W. H. ALEXANDER,
Secretary.

Report of the Treasurer for the Year 1932–1933.

ATHENS, OHIO, April 14, 1933.

To the Ohio Academy of Science:

Despite evident hardship on the part of some individual members of the Academy the payment of dues has been excellent under the present conditions. It is evident that the members of the Academy show a loyalty to an organization which they desire to support. There have been a number of resignations which the Treasurer has had reluctantly to accept. It is to be hoped that they will be counterbalanced by an equal number of new members who will remain with the Academy.

Economies have been effected by not publishing a separate Proceedings and by reducing the amount of printed matter in the Proceedings. The reduction will not become effective until next year, as the present report includes the cost of the Proceedings issued last July.

The investment of the Academy is in the form of Liberty Bonds, of which we have $1,750.00.

With the economies in the Proceedings, namely, the elimination of the membership list, the elimination of abstracts of papers presented at the meetings and the reduction to the minimum of the printed matter concerning the position of the Academy, it probably will not be necessary to withdraw any funds from the permanent investment at the present time. For this the members of the Academy are to be gratefully congratulated.

RECEIPTS.

Cash balance on hand April 25, 1932	$ 222.19
Receipts from Sale of Publications	46.85
Received from A. A. A. S.	144.50
Dues from Members; Back Dues Collected	913.00
Transferred from Trust Account (during Bank Holiday)	37.65
Interest from Bonds	74.41
Deposited by error of Bank to wrong account	7.00
Total Receipts	$1,445.60
Total Receipts	$1,445.60
Total Disbursements	1,007.45
Cash balance on hand April 1, 1933	$ 438.15

DISBURSEMENTS.

W. H. Alexander, Secretary's Honorarium	$ 100.00
Spahr & Glenn Co., for Programs, 42nd Annual Meeting; Statements, Letterheads, 100 Return Envelopes, Preliminary Announcements, and Radio Program	99.67
Roof Stenographic Service, for the Secretary	24.67

C. J. Shatzer, Report of Junior Scientific Endeavor	23.15
E. M. Spiker, Expenses for Geol. Section, 42nd Annual Meeting	5.96
D. M. DeLong, Expenses for Zool. Section, 42nd Annual Meeting	1.40
One-cent Postage Stamps, Rose McCabe	10.29
H. B. English, Expenses for Vice-President for 42nd Annual Meeting	4.00
F. G. Tucker, Expenses for Vice-President for 42nd Annual Meeting	7.32
A. T. Evans, Expenses for Vice-President for 42nd Annual Meeting	9.00
Shiro Tashiro, Expenses for Vice-President for 42nd Annual Meeting	9.40
Herbert Osborn, check credited to account by error of Bank	7.00
R. A. Budington, Expenses for Executive Committee, 1932 Meeting	4.08
M. E. Stickney, Expenses for Executive Committee for 1932 Meeting	1.80
J. C. Goodman, "Save Out-Door Ohio" membership Dues	12.00
B. S. Meyer, Business Manager, Ohio Journal of Science, for 167 members in the Academy for 1932, at $1.50 each	250.50
R. A. Budington, Expenses for Executive Committee, meeting 1932	4.55
W. H. Alexander, Expenses for 1933 Meeting	20.00
Transferred to Trust Account (by Bank, during Bank Holiday)	37.65
Rose McCabe, Secretarial Services for the Treasurer	33.50
B. S. Meyer, Business Manager, Ohio Journal of Science, (1932 Proceedings of the Ohio Academy of Science)	321.17
Checks returned	20.00
Tax for writing checks	.34
Total Disbursements	$1,007.45

Respectfully submitted,

A. E. Waller,
Treasurer.

Auditor's Report.

Columbus, Ohio, April 10, 1933.

Professor A. E. Waller, Treasurer,
The Ohio Academy of Science, Columbus, Ohio.

Dear Sir:—Complying with your instructions, I have completed my examination of your records of The Ohio Academy of Science and find the receipts for the period from April 25, 1932, to April 1, 1933, of $1,223.41, to be correctly accounted for in the statements of The Huntington National Bank, depository for the Academy. Disbursements of $1,007.45 for the same period have been verified by cancelled checks and voucher charge slips of the Bank and found to be correct. The cash position for the period is as follows:

Cash Balance April 25, 1932		$222.19
Cash Receipts—April 25, 1932, to April 1, 1933	$1,223.41	
Cash Disbursements for same period	1,007.45	
Increase Cash Position		215.96
Cash on hand April 1, 1933		$438.15

Since the dates of payment of members dues were missing in a few of the accounts it was not possible for me to verify exactly the dues of $913.00 as shown in Treasurer's report. I feel certain, however, that all receipts have been properly accounted for.

Respectfully submitted,

James P. Cornetet,
Certified Public Accountant.

Report of the Executive Committee.

By William H. Alexander, *Secretary.*

Athens, Ohio, April 14, 1933.

To the Ohio Academy of Science:

Your Executive Committee begs to submit through its Secretary the following report of its transactions during the year ending with this meeting, viz.:

The committee has held three meetings as an executive committee and has met in joint session with the Vice-Presidents of the Academy as a Committee on the Election of Fellows.

The first meeting of the Committee was held on October 29, 1932, at the office of the Secretary, with all members present, and by invitation Dr. Herbert Osborn, Editor of the Ohio Journal of Science, and Dean C. G. Shatzer, former chairman of the Committee on Junior Scientific Endeavor. The discussions of the various matters that came before the committee resulted in the following conclusions:

1. That owing to the reduced funds in the treasury the Editor of the Journal should take seriously into consideration the question of reducing the number of pages of the Journal.

2. That (and for the same reason) the publication of abstracts of papers presented at the Annual Meeting of the Academy should be omitted from the published Proceedings, for the present at least.

3. That notwithstanding the obvious merits in the Junior Scientific Endeavor movement as revealed in the fine efforts and report of Dean Shatzer, it was the unanimous opinion of the Committee that owing to a lack of funds to meet and overcome the practical difficulties obviously inherent in the work, as pointed out by Dean Shatzer, the only thing to do is to hold the matter in abeyance for the present at least. And the Committee so recommends. (See p. 290, Proceedings 1932.)

4. Regarding the matter of an "Academy accounting system and custody of funds," etc., referred to this Committee by vote of the Academy at the last Annual Meeting (Proceedings 1932, p. 267), the Committee found itself quite in harmony with the views of the Treasurer as to the need of a better method of auditing the accounts and accordingly authorized the Treasurer to enter into negotiations with the proper department or officials at the Ohio State University and solicit their assistance in devising a suitable method to recommend to the Academy for its approval.

5. As to the question raised by the Chairman of the Library Committee relative to the disposition of funds received from the sale of Proceedings, etc. (see p. 270, Proceedings 1932), the Executive Committee recommends that these funds be credited to the Academy.

6. As to the place for holding the Annual Meeting for 1933 the Committee decided unanimously to accept the offer of the Ohio University, Athens, and the exact date to be left with the Secretary after further negotiations with the Ohio University, assuming some date during or very near the Easter Holidays would be finally agreed upon.

7. The Secretary was instructed to correspond with the officials of the West Virginia Academy of Science with a view to a joint meeting of the two academies if such was thought desirable and practicable and provided further such a joint meeting would be agreeable to the Ohio University.

8. President Budington was unanimously elected to represent the Ohio Academy on the Council of the American Association for the Advancement of Science and on the Academy Conference at the Atlantic City meeting.

9. A subcommittee, consisting of Prof. Alpheus W. Smith, Chairman; President Budington and Secretary Alexander, was named to investigate the feasibility and advisability of the Academy sponsoring the broadcasting of a series of scientific talks or addresses and report back to the full committee at its next meeting.

The second meeting of the committee was held in the office of the Secretary on January 6, 1933, with four of the five members present. At this meeting the following items of business were transacted, viz.:

1. The Treasurer reported progress in his negotiations with Ohio State University authorities relative to a system of auditing and accounting. He was requested to continue his efforts.

2. The Secretary read a letter from the Secretary of the West Virginia Academy of Science relative to a proposed joint meeting of the two academies which said in part: "Our Academy was not in favor of meeting out of the State this year. * * * Perhaps in the future, when the Academy members feel they can afford to travel a little further, we can arrange for a joint meeting."

3. The Secretary reported for the sub-committee on the series of proposed radio talks that Professor Smith had secured the generous co-operation of the Ohio State University in putting on one talk a week from station WEAO and that he (the Secretary) had met with a ready response on the part of members to give such talks and that the series would begin at 7:45 P. M. on January 6, 1933, President Budington being the first speaker. (See Appendix B.)

4. A petition signed by 68 prominent chemists of the State (see Appendix A) asking permission to organize a *Section of Chemistry of the Ohio Academy of Science*, was then laid before the Committee, carefully considered and by a unanimous vote the permission was granted subject to ratification by the Academy, which action we now recommend. The Executive Committee requested Professor William Lloyd Evans, Ohio State University, to serve as the Acting Vice-President of the Section of Chemistry until the annual meeting of 1933.

5. The Committee voted that we should have at least one invited speaker for the annual meeting. Several names were suggested and the Secretary was instructed to correspond with them and make such selection or selections as to him seemed best or possible.

The third meeting of the Executive Committee was a joint meeting with the Vice-Presidents as a Committee on the Election of Fellows, a full report of which will be made later.

The fourth and last meeting was held last evening at Hotel Berry, Athens, Ohio, when it was agreed that:

1. The matter of continuing the series of radio talks should be left with incoming Executive Committee.

2. Membership in the "Save Outdoor Ohio Council" should be continued.

3. That in order to provide for a suitable accounting system, *Section 3, Chapter V of the By-Laws* of the Academy should be so amended as to provide for the audit of all the financial accounts of the Academy by a competent accountant, and that the fiscal year be the calendar year instead of from annual meeting to annual meeting as at present.

4. That the duties now performed by the Publication Committee and the Special Committee on Relations might well be combined under one committee.

5. That there should be a re-statement of the fourth recommendation of the Joint Committee (Publication Committee and Special Committee on Relations) relative to paying for the printing of the Proceedings Number of the Journal. (See p. 287, Proceedings 1932.)

Report of the Publications Committee.

(Informal.)

OBERLIN, OHIO, April 11, 1933.

Mr. W. H. Alexander, 8 East Broad Street, Columbus, Ohio.

DEAR MR. ALEXANDER:—I am sorry to have to report that it will not be possible for me to attend the meeting of the Ohio Academy at Athens this week. Blake and Moseley report that they will also be unable to be present. That will give the Publications Committee a zero for attendance and will make it impossible for a report to be presented by the Publications Committee.

As a matter of fact, the Committee has nothing to report, for its activities have been nil. You have been so good as to see through the press the Proceedings of the last annual meeting and arrange for its publication in the Ohio Journal of Science. Besides the Proceedings there have been no publications by the Academy during the current year. May I ask you to make whatever report seems necessary on the publication of the Proceedings. It seems too bad to burden you with anything more than you already have to carry, but your shoulders are broad, your efficiency is equal to anything, and your kindness is proverbial, so I add another to the impositions which are continually being placed upon you.

With best wishes, I am

Sincerely yours,

FREDERICK O. GROVER,
Head, Department of Botany.

Report of the Trustees of the Research Fund.

COLUMBUS, OHIO, April 1, 1933.

To the Ohio Academy of Science:

As in the preceding year, no grants to individuals have been made, as it seemed desirable still to hold the balance available for possible readjustments of the invested fund. The following summary of the account for 1932–33 shows an invested fund of $1,737.50 and a balance in uninvested account subject to check of $228.36.

SUMMARY OF ACCOUNT, 1932–33.

RECEIPTS.

Balance from checking account, April 22, 1932	$ 137.86
Interest receipts from invested funds	90.50
Total	$ 228.36

BALANCE.

Balance in checking account	$ 228.36

SUMMARY OF ASSETS.

Invested Funds, Bonds and Certificates at face or cost	$1,737.50
Uninvested bank balance, in Ohio National Bank	228.36
Total	$1,965.86

The interest payments on bonds which were temporarily suspended have been renewed on a reduced interest basis, and it is believed that payments of interest may be expected regularly hereafter. Since there is now a small balance of uninvested funds we may consider the granting of some small sums for research projects and, unless the Academy favors further building up of the research fund, the Trustees will be ready to receive requests for grants during the coming year.

It may be noted that the interest payments for the year have amounted to a little more than 5% on the invested fund.

(Signed) HERBERT OSBORN, Chairman,
GEO. D. HUBBARD,
L. B. WALTON,
Trustees.

Auditor's Report.

COLUMBUS, OHIO, May 13, 1933.

Mr. William H. Alexander, Secretary,
The Ohio Academy of Science, Columbus, Ohio.

DEAR SIR:—I have completed my Audit of the Research Fund of the Trustees of The Ohio Academy of Science and find the same to be correct. The balance on deposit in The Ohio National Bank of $228.36 has been verified and found correct. The invested funds of $1,737.50 are found to consist of $1,300.00 of Fort Hayes 7% Bonds maturing October 15, 1934, and 25 shares of BancOhio Capital Stock.

The 25 shares of BancOhio were purchased November 27, 1931, at $17.50 per share. The market quotation of this stock today is $10.00 per share. There is no public market on the Fort Hayes Bonds that I have been able to find, which, perhaps is somewhat due to the proposal and plan as outlined in a letter of March 8, 1932, by the Bondholders Protective Committee. Briefly this plan was to issue Sinking Fund Bonds bearing 5% interest dating the issue January 1, 1932, and maturing the Bonds January 1, 1947.

There is undoubtedly a limited market for these Bonds today and I would suggest that some consideration be given the possibility of disposing of your holdings in exchange for other investments more readily salable and with possibilities for a more rapid recovery in value.

Respectfully submitted,

JAMES P. CORNETET,
Certified Public Accountant.

Report of the Library Committee.

COLUMBUS, OHIO, April 12, 1933.

To the Ohio Academy of Science:

There is little to report this year. The routine work of keeping the mailing list correct, of taking care of the few sales, of claiming the issues of the exchanges that somehow failed to arrive, and of posting issues of our publications to replace those which did not reach their

destinations, have constituted the greater part of the work which has been done during the past year.

Fourteen new exchanges have been secured. One of them is a joint publication of two state academies, Colorado and Wyoming.

The privilege of withdrawing books from the Ohio State University Library is called again to the attention of the members of the Academy. It is learned each year that some of the members, especially the newer ones, do not know that they are entitled to draw out books as individuals if they live at a distance from a college or university library. For those who are associated with a college it is preferred that they draw books through their own library on the inter-library loan plan. There is much material in our library that surely could be of use to the members of the Academy if they would use it.

The sales of publications have been disappointing this year, only slightly more than twenty-five dollars. As the present incumbent has had six good years with the sales ranging from sixty-three dollars to eighty-nine dollars, this seventh year should also have been a year of plenty. It is to be hoped that there will not continue to be six or seven lean years.

As the financial report is so little this year, the chairman of this committee was interested to learn the amounts of former years and found that ten years ago the sales amounted to practically the same as they have this year. A very brief history of the sales record may be of interest. No mention of selling publications is made in any of the Annual Reports of the Academy until 1904 when the Treasurer, Dr. Herbert Osborn, reported the sum of $5.09 for "publications sold and miscellaneous receipts" during 1903–1904. Then Mr. W. C. Mills was appointed librarian. He reported $21.43 for 1904–1905, and nearly fifty-nine dollars for his best year, 1911–1912. His total amount for the entire time that he was librarian, 1904–1914, was $311.69. When the library of the Academy was deposited in the Ohio State University Library, Mr. Mills stated in his last annual report that for many years the sales had not begun to pay the postage necessary for mailing the special papers and annual reports, but now that the University had agreed to pay all postage, the funds received from the sale of publications would be another asset to the Academy. From 1915 to 1925, when the Main Library of the Ohio State University had charge, the sales amounted to $252.42 for Mr. C. W. Reeder's nine years, and $65.89 for Miss Alice McKee's two years, making a total of $318.31 for the eleven years, which was nearly the same amount as the $316.78 of the previous eleven years. From 1926 on to date the total amount of sales has been $498.40. Adding the bank dividends of $32.89 onto this sum, there is a total of $531.29. The complete total of all the sales of publications for the entire period of nearly thirty years is $1,166.38. Of this amount, $316.78 was used for postage, leaving the sum acquired since the Library took charge, of $849.60, as an asset to the Academy. The original cost of publishing the Special Papers and the Annual Reports has not been taken into consideration. It is mainly the former that are desired by purchasers and all of them except the first two and the last two were published with funds from the Emerson McMillin research fund.

If we do not consider numbers 13 and 15, there is a plentiful supply of each Special Paper except numbers 4, 5, and 6, of which there are 38 copies of No. 4, "The Fishes of Ohio;" 67 copies of No. 5, "The Tabanidae of Ohio," and 28 copies of No. 6, "The Birds of Ohio."

Only 40 papers were sold this year as compared with 129 papers last year, and with 166 the preceding year. The same one which headed the list last year headed it again this year, "The Fishes of Ohio," and for the same reason, which was that they were sold at the Franz Theodore Stone Laboratory to the students of Dr. R. C. Osburn's fish class.

The following financial report is submitted:

RECEIPTS.

Cash balance on hand April 28, 1932	$ 71.55
Collected on 1931–1932 sales	.60
Sales for 1932–1933	26.65
Bank dividends for 1932	2.69
Total Receipts	$101.49

EXPENDITURES.

A. E. Waller, Treasurer, for sales, 1931–1932	$ 41.85
A. E. Waller, Treasurer, on account, 1932–1933 sales	5.00
Government two mill tax	.10
Total Expenditures	$ 46.95
Balance in bank April 12, 1933	$ 48.14
Cash on hand	5.40
Outstanding accounts	1.00
Expenditures, 1932–1933	46.95
Total	$101.49

SUMMARY OF ASSETS.

Unexpended balance on 1932–1933 sales	$ 21.65
Accumulated bank dividends, 1926–1932	32.89
Total Assets	$ 54.54

ANNUAL REPORTS OF PROCEEDINGS AND SPECIAL PAPERS. 1892–1931.

ANNUAL REPORTS.

First to Sixteenth	30 cents each
Seventeenth to Twenty-fourth and Twenty-sixth to Thirty-seventh	40 cents each
Twenty-fifth	75 cents
Thirty-eighth to Forty-first	50 cents each

SPECIAL PAPERS.

1.	Sandusky Flora. pp. 167. E. L. MOSELEY	60 cents
2.	The Odonata of Ohio. pp. 116. DAVID S. KELLICOTT	60 cents
3.	The Preglacial Drainage of Ohio. pp. 75. W. G. TIGHT, J. A. BOWNOCKER, J. H. TODD AND GERARD FOWKE	50 cents
4.	The Fishes of Ohio. pp. 105. RAYMOND C. OSBURN	$1.00
5.	Tabanidae of Ohio. pp. 63. JAMES S. HINE	50 cents
6.	The Birds of Ohio. pp. 241. LYNDS JONES	$2.00

7. The Ecological Study of Big Spring Prairie. pp. 96. THOMAS A. BONSER.....50 cents
8. The Coccidae of Ohio. I. pp. 66. JAMES G. SANDERS.....50 cents
9. Batrachians and Reptiles of Ohio. pp. 54. MAX MORSE.....50 cents
10. Ecological Study of Brush Lake. pp. 20. J. H. SCHAFFNER, OTTO E. JENNINGS, FRED J. TYLER.....35 cents
11. The Willows of Ohio. pp. 60. ROBERT F. GRIGGS.....50 cents
12. Land and Fresh-water Mollusca of Ohio. pp. 35. V. STERKI.....50 cents
13. *The Protozoa of Sandusky Bay and Vicinity. F. L. LANDACRE.....$1.00
14. Discomycetes in the Vicinity of Oxford. pp. 54. FREDA M. BACHMAN.....50 cents
15. *Trees of Ohio and Surrounding Territory. pp. 122. JOHN H. SCHAFFNER.....$2.00
16. The Pteridophytes of Ohio. pp. 41. JOHN H. SCHAFFNER.....50 cents
17. Fauna of the Maxville Limestone. pp. 65. W. C. MORSE.....60 cents
18. The Agaricaceae of Ohio. pp. 116. W. G. STOVER.....75 cents
19. An Ecological Study of Buckeye Lake. pp. 138. FREDERICA DETMERS.....75 cents
20. Flora of the Oak Openings West of Toledo. pp. 56. E. L. MOSELEY..50 cents
21. The Cedar Cliffs Prairie Opening of the Cincinnati Region. pp. 36. N. MILDRED IRWIN.....60 cents

Address: MRS. ETHEL M. MILLER, Library, Ohio State University, Columbus, Ohio.

Respectfully submitted,

ETHEL M. MILLER,
Chairman.

Auditor's Report.

COLUMBUS, OHIO, May 8, 1933.

Mr. William H. Alexander, Secretary,
The Ohio Academy of Science, Columbus, Ohio.

DEAR SIR:—I have completed my audit of the statements submitted by your Librarian, Mrs. Ethel M. Miller, for the period ending April 12, 1933, and find them correct in every detail.

Verification of the cash position reveals $48.14 on deposit with the Buckeye State Building and Loan Company; $4.35 cash on hand; $2.05 in postage stamps. A total of $54.54.

In my audit of this fund I find the account of the Academy reflecting the deposited funds of $48.14 is carried in an Installment stock account, which, due to a recent ruling of Buckeye State Building and Loan Company cannot be transferred and is at the present time subject to restricted withdrawals of $10.00 per month. While this deposit is, in my opinion, in a sound institution, I would suggest it be gotten in a more liquid form should there be a demand for an amount exceeding the present restricted withdrawal of $10.00.

Disbursements during this period of $46.95 are properly evidenced by receipts from Professor A. E. Waller, Treasurer.

Respectfully submitted,

JAMES P. CORNETET,
Certified Public Accountant.

*Temporarily out of print.

Report of the Committee on State Parks and Conservation.

To the Ohio Academy of Science:

Your committee is pleased to report that certain definite steps have been made during the year that promise results of permanent value. A meeting of the committee was called for January 5, 1933, by Edward S. Thomas, on request of the Chairman, who was absent from the city. The following members were present: E. Lucy Braun, Edmund Secrest, Emery R. Hayhurst, E. S. Wickliff, Wilbur E. Stout, Roscoe W. Franks, and Edward S. Thomas. There were also present in an advisory capacity, by invitation of committee: Dr. E. N. Transeau, Dr. D. M. DeLong, Dr. C. H. Kennedy, Annette Braun and Robert L. Gordon.

Miss Lucy Braun and Mr. Thomas, State Representatives for Ohio of the Committee on the Preservation of Natural Conditions of the Ecological Society of America, presented an outline of the plans of that society for the preservation of natural biotic communities. The plan, in brief, is for the establishment of inviolate Nature Sanctuaries in suitable localities throughout the United States. Three classes of sanctuaries are proposed, of which only the third class is available in Ohio, since the first two classes contemplate areas in which the original flora and fauna have been undisturbed or practically so.

The following areas or habitats were suggested as desirable for Nature Sanctuaries by various members of the committee: Little Rocky Branch, Hocking County; various ravines along Queer Creek, Old Man's Cave State Park; Roosevelt Game Preserve; Scioto Trail Forest, 8,500 acres; Shawnee Forest, 30,000 acres, including interesting hilltop areas on the tops of the ridges; the spectacular ant mounds of Adams County near Lawshee; Jefferson Preserve; portions of the interesting habitats in the Illinoian drift plains of southern Ohio; Cedar Swamp, Champaign County; the Oak Openings west of Toledo; Adams County dry prairies; Rhododendron areas; Dean Forest; areas along the Lake shore, especially the few dune areas, such as at Bay Point; some of the school lands in Colerain Township, Ross County; West Sister Island, Lake Erie; Tamarack Bogs of northeastern Ohio—Fox Lake, Punderson's L.; some good Beech-Maple area, if any yet to be found; White Pine area, such as at Loudenville; a fine tract of Oak-Liriodendron forest six miles from Gallipolis; some of the canal beds still remaining; areas of wet prairie; the tamarack bog owned by the city of Akron near Lake Rockwell; Fox Lake; an undisturbed area, if any, in the Black Swamp region; a cove with fine Tulip Trees just east of Hanging Rock.

State Forester Secrest tendered his fullest support to the project of preventing damage to floral and faunal areas, and offered any portion of the state forest for the purpose which might be suitable, subject, of course, to the consent of the trustees of the board. He suggested that Little Rocky Branch of Pine Creek would make an ideal preserve, since it was relatively undisturbed and not frequently visited by the public. It was suggested that it would be advisable not to fence off any such preserve in the state forests or erect special signs, until adequate

warden service was available, in view of the fact that the state forest regulations already provide sufficient restrictions against vandalism.

Mr. Wickliff offered the co-operation of the Division of Conservation and suggested that since Roosevelt Preserve was now closed to the public, it would make an ideal area for the preservation of the native flora and fauna.

It was thereupon moved, seconded and carried that the Division of Conservation be invited to make a sanctuary of the Roosevelt Preserve, and Mr. Wickliff was requested to present such invitation to the Conservation Council.

The Academy has been represented on the Save Outdoor Ohio Council by Dr. Waller and the chairman of this Committee and certain legislation sponsored by the Council is still awaiting action in the legislature. While some specific items of special interest to our Academy have apparently been overlooked, several of the bills, if enacted, will prove of advantage in promoting conservation.

Respectfully submitted,

E. Lucy Braun, E. L. Wickliff,
Ernest J. Carman, Wilbur Stout,
Roscoe Franks, E. S. Thomas,
Edmund Secrest, Herbert Osborn, Chairman,
Emory R. Hayhurst,

Report of Committee on Election of Fellows.

Athens, Ohio, April 15, 1933.

To the Ohio Academy of Science:

The Committee on the Election of Fellows met at 6:45 P. M., April 14, 1933, at Hotel Berry, Athens, Ohio, with ten members present, three absent. The following members of the Academy whose nominations were in proper form and accompanied by satisfactory documentary evidence of the nominee's scientific achievements, received the required three-fourths vote of the Committee and were accordingly declared duly elected to Fellowship in the Academy, viz.:

David Dietz Roderick Peattie
Rush Elliott William C. Stehr
Robert A. Kehoe

Respectfully submitted,

William H. Alexander,
Secretary.

Report of the Membership Committee.

ATHENS, OHIO, April 15, 1933.

To the Ohio Academy of Science:

Your Committee on Membership submits the following applications in due form and recommends the election of the applicants to membership in the Academy, viz.:

BATTELLE MEMORIAL INSTITUTE, 505 King Avenue, Columbus.
BENTLEY, W. B., Ohio University, Athens. *Chemistry.*
BRANSON, WENDELL, 15 Franklin Avenue, Columbus. *Biology.*
BURHANS, NATHANIEL C., 1105 W. Lane Avenue, Columbus. *Geography.*
BUSCH, K. G. A., 2424 Sherwood Road, Columbus. *Chemistry; Geology.*
CUNNINGHAM, HARRY A., 320 E. Erie Street, Kent. *Biology; Science of Education.*
CURTIS, GEORGE M., 4690 Sunbury Road, Columbus. *Medical Sciences; Biological Sciences.*
DOAN, CHARLES A., 324 Fallis Road, Columbus. *Medical and Biological Sciences.*
EVERHART, W. A., Denison University, Granville.
FERNELIUS, W. CONARD, 2084 Neil Avenue, Columbus. *Chemistry.*
GULLUM, FRANK B., 128 Lancaster Street, Athens. *Chemistry.*
HOLLINGSWORTH, MARION, Dept. of Chemistry, O. S. U. *Chemistry.*
HOOD, G. RAYMOND, 516 S. Main Street, Oxford. *Chemistry (Geology).*
HORN, ROBERT C., 505 Locust Avenue, Zanesville. *Physics.*
INMAN, ELIZABETH, Bowling Green. *Botany; Biology.*
JOHNSTON, HERRICK T., 321 E. Twentieth Avenue, Columbus. *Chemistry; Physics.*
LEUBA, CLARENCE, Antioch College, Yellow Springs. *Psychology.*
MATHENY, WILLIAM A., Box 528, Athens. *Botany.*
MOYER, HARVEY V., Department of Chemistry, O. S. U. *Chemistry.*
PALMER, MAURICE B., Kent State College, Kent. *Chemistry; Physics.*
ROTHEMUND, PAUL (W. K.), Antioch College, Yellow Springs. *Chemistry; Medicine.*
SINNETT, RALPH V., 95 Oak Hill Avenue, Delaware. *Chemistry.*
SONTAG, W. L., Yellow Springs. *Biology; Medicine; Psychology.*
THOMSEN, HARRY L., 207 E. College Street, Oberlin. *Geology; Astronomy; Chemistry.*
VERMILLION, MONROE T., 13 Mound Street, Athens. *Botany; Biology.*
WESP, EDWARD F., 1501 Neil Avenue, Columbus. *Chemistry; Physics.*
WOLFROM, M. L., Department of Chemistry, O. S. U., Columbus. *Chemistry.*
YOHE, G. R., 207 N. Franklin Street, Delaware. *Chemistry.*

Respectfully submitted,

J. PAUL VISSCHER, *Chairman,*
HOPE HIBBARD,
EUGENE VAN CLEEF.

Report of the Committee on Necrology.

ATHENS, OHIO, April 15, 1933.

To the Ohio Academy of Science:

The Committee on Necrology presents the following report:

EDO N. CLAASSEN.

A Charter Member of the Academy and one who took a very active interest in its affairs for many years, Mr. Claassen died at Cleveland, July 12, 1932, at the very advanced age of 99 years. Born and educated in Germany, where he received a degree in pharmacy from the University of Göttingen, he came to Cleveland in 1867 and engaged in the

drug business. He was also city chemist of Cleveland for a number of years in the early 1880's. An able chemist, he contributed to research in various phases of this field and, among other discoveries, he is credited with the isolation of the bitter principle of cranberries.

Always interested in and conversant with various phases of biological work, his chief interest was in botany. He made extensive collections of plants and gave a series of some 10,000 specimens to the Western Reserve University. This collection, which has been made a memorial to him, is especially rich in grasses and liverworts.

During his long and active life, Mr. Claassen published over a hundred papers, of which 31 dealt with Ohio botany and nearly all of these have been published in the Annual Reports of the Academy or in the Ohio Naturalist or Ohio Journal of Science. The first of these publications is dated 1892, the last in 1924 when he was 91 years of age.

His quiet and sincere personality, his broad knowledge and his interest in the work of younger men were outstanding traits, and these in addition to his contributions to science, caused him to be highly appreciated during his forty years of association with the Ohio Academy of Science.

Victor Sterki.

Mr. Sterki was born in Soluthurn, Switzerland, in 1846 and died at his home in New Philadelphia on January 25, 1933, in the 87th year of his age. He studied at Munich and received the M. D. degree at Bern in 1873. He practised medicine in Switzerland until 1883, when he removed to New Philadelphia.

He was especially interested in Mollusca and became one of the best known students of the land and freshwater species in America. In all 52 of his publications deal with Ohio Mollusca. Most of this work was published in "The Nautilus," but 14 papers are to be found in the Annual Reports of the Ohio Academy, The Ohio Naturalist and the Ohio Journal of Science. The best known of these is "The Land and Freshwater Mollusca of Ohio," Special Paper No. 12 of the Ohio Academy of Science.

Mr. Sterki became a member in 1894 and contributed many papers at the annual meetings. In 1909 he was appointed Assistant Conchologist at the Carnegie Museum at Pittsburgh and later was advanced to Associate Curator of Mollusca, a position which he retained until advancing years and ill health compelled him to retire. His extensive collections are deposited in the Carnegie Museum. He was an enthusiastic collector and a careful and diligent worker, and has made a definite and permanent place for himself in the conchology of America.

F. L. Odenbach.

The Rev. Frederick L. Odenbach, S. J., a member of the Academy since 1899, died at Cleveland on March 15, aged 75 years. For the past forty years he had been meteorologist and seismologist at the John Carroll University in Cleveland. The influence of Father Odenbach in this field of science was such that by his initiative seismological stations were installed at fifteen Jesuit institutions in the United States

and Canada from 1909 to 1912. His work attracted wide interest and he was well known in his chosen field of research.

Miss Wilhelmine Werdelmann.

Miss Werdelmann, night supervisor of the University Hospital at Ohio State University, died on February 23, 1933. She was born in Dresden, Germany, served as nurse in that country during the world war and came to America about ten years ago. After a time she took special training and was graduated from the University in 1928. Being a woman of unusual ability, she was rapidly advanced and for the past two years she had entire charge of the hospital during the night. She became a member of the Academy at the 1932 meeting.

E. B. Williamson.

Edward Bruce Williamson, of Bluffton, Indiana, a member of the Academy since 1897, died at Ann Arbor, Michigan, February 28, 1933, aged 55 years. He was well known to the entomologists of the world, especially as an authority on the Odonata. He was a nephew of Prof. W. A. Kellerman, who contributed so largely to systematic botany in Ohio.

He was graduated at Ohio State University in 1898 at the age of 20, was an assistant curator at the Carnegie Museum of Pittsburgh for a year, taught science in the high school at Salem, Ohio, 1899–1900, and was fellow in zoology at Vanderbilt University the following year.

Though for nearly thirty years the banking business absorbed a large share of his time, he never ceased his scientific work and publications of real worth flowed in continuous series from his pen. His short vacations from business were all spent in the field and he had made collections of dragonflies in Guatemala and several parts of South America as well as in different regions of the United States. He was an indefatigable worker, applying himself at his research usually far into the night.

Since 1930 Mr. Williamson spent the winter months as Curator of Odonata at the Michigan Zoological Museum at Ann Arbor, where his very extensive collections and exhaustive library on Odonata are deposited. The summer was spent at his Iris farm at Bluffton, Indiana, where he had produced many of the finest varieties of Iris developed in the country.

He had a wide knowledge in many fields of thought, and an enthusiastic interest in all phases of natural history which was so contagious that no one could come into contact with him for even a short time without feeling it.

His writings are published chiefly in entomological journals, though several of his earlier papers appear in the Annual Report of the Ohio Academy and the Ohio Naturalist.

Raymond C. Osburn,
Committee on Necrology.

Report of the Administrative Board of the Ohio Journal of Science.

To the Ohio Academy of Science:

Two meetings of the Administrative Board have been held since the submission of the last report.

The first meeting was held November 12, 1932. Present were Messrs. Rice, Transeau and Blake of the Board; Herbert Osborn, Editor, and B. S. Meyer, Business Manager. At this meeting Professor Osborn tendered his resignation as Editor, which was accepted with regret by the Board. Dr. L. H. Snyder, the incumbent Associate Editor, was unanimously elected as Editor for the coming year. All of the other officers of the Journal and the Administrative Board were re-elected for the coming year, except that the position of Associate Editor was left vacant. A list of these officers was included in the preceding report of the Board. Other business at this meeting was of a routine nature.

The second meeting of the Board was held April 8, 1932. Present were Messrs. Rice, Transeau and Blake of the Board; L. H. Snyder, Editor, and B. S. Meyer, Business Manager.

It was agreed by the Board that the Editor should be authorized to accept papers for publication in the Journal out of their order of acceptance, if the sponsors of the papers would defray half of the cost of publication.

Motion was carried by the Board to transmit to the Academy the recommendation that the present arrangements for the printing of the Proceedings by the Journal be continued in force, (page 287, 1932 Proceedings).

Motion was carried by the Board that the Academy act definitely on the recommendations of the Joint Committee on the relation between the Academy and the Journal (pp. 287–288, 1932 Proceedings). No record of any action by the Academy is included in last year's Proceedings.

The following financial report was presented by the Business Manager and audited by a committee consisting of E. L. Rice and E. N. Transeau:

FISCAL YEAR 1932.

(As of March 15, 1933.)

RECEIPTS.

Balance from 1931	$ 336.13
Annual University Allowance	900.00
Dues from Ohio Academy of Science	600.00
Subscriptions	100.40
Authors' Payments for Plates	167.93
Sales of Back Numbers	12.00
	$2,116.46

EXPENDITURES.

Spahr & Glenn Co., Printing first four numbers, Vol. 32	$1,437.90
Envelopes and Office Supplies	31.85
Bucher Engraving Co	335.34

James R. Geren, Postmaster	131.67
Clerical assistance	8.00
Purchase of back numbers of Journal	1.00
Federal check tax	.44
	$1,946.20
Balance on hand, March 15, 1933 (Huntington National Bank, Columbus)	170.26
	$2,116.46

All actions of the Administrative Board during the past year have been unanimous.

Respectfully submitted,

B. S. MEYER,
Secretary of the Board.

Report of the Nominating Committee.

ATHENS, OHIO, April 15, 1933.

To the Ohio Academy of Science:

The Committee on Nominations has the honor to submit the following:

President—E. LUCY BRAUN.

Vice-Presidents:

A. *Zoology*—NEALE F. HOWARD.
B. *Botany*—ORVILLE T. WILSON.
C. *Geology*—WILLIAM A. P. GRAHAM.
D. *Medical Sciences*—ROBERT A. KEHOE.
E. *Psychology*—RICHARD S. UHRBROCK.
F. *Physics and Astronomy*—RAY LEE EDWARDS.
G. *Geography*—RODERICK PEATTIE.
H. *Chemistry*—WILLIAM LLOYD EVANS.

Secretary—WILLIAM H. ALEXANDER.

Treasurer—A. E. WALLER.

Elective Members, Executive Committee—R. A. BUDINGTON AND JAMES P. PORTER.

Trustee, Research Fund—ALPHEUS W. SMITH.

Publications Committee—F. O. GROVER, J. E. CARMAN, S. W. WILLIAMS.

Library Committee—FREDERICK C. BLAKE.

Committee on State Parks and Conservation—EDMUND SECREST, H. C. SAMPSON AND EMERY R. HAYHURST.

Representatives on Save Outdoor Ohio Council—HERBERT OSBORN AND E. N. TRANSEAU.

Respectfully submitted,

DWIGHT M. DELONG, *Chairman*, SHIRO TASHIRO,
ARTHUR T. EVANS, HORACE B. ENGLISH,
EDMUND M. SPIEKER, F. G. TUCKER,
EUGENE VAN CLEEF,
Committee.

Report of the Committee on Junior Scientific Endeavor.

By C. G. Shatzer.

The Ohio Academy of Science in accord with a recommendation of the committee offered at the April, 1932, meeting, dismissed the committee. The project of encouraging Junior Scientific Endeavor was referred to the Executive Committee for review with power to act.

An opportunity has presented itself to the dismissed committee to promote the project. R. L. Baird and C. G. Shatzer conferred with Mr. B. O. Skinner, Director of the Ohio State Department of Education, and found that he is very much interested in the project. As a result of this conference it is recommended:

1. That a central office be established where high school students may secure information concerning their nature discoveries and to which they may send material for identification.
2. That Mr. Skinner be informed that his offer to print and distribute copies of a 4- or 8-page bulletin is greatly appreciated and that immediate steps will be taken to place such a bulletin at the disposal of high school students.
3. That a member of the Academy be sought who will volunteer his services to conduct the office and prepare the bulletin suggested in Item 2 for the year 1933–34.
4. That specialists in the various fields of science be sought among the members of the Academy who will co-operate with the director in preparing the bulletin material and identify specimens submitted by the students.
5. That the Ohio Academy of Science appropriate an amount not to exceed $100.00 to defray postage charges for the director's office, transportation of specimens, cost of paper for the bulletin, etc., for the year 1933–34.

Memorandum.

(Supplemental to the Report of the Committee on Junior Scientific Endeavor.)

Re. visit of Mr. R. L. Baird and Mr. C. G. Shatzer to Mr. B. O. Skinner, March 29, 1933.

Re. co-operation between the Ohio Academy of Science and the Ohio State Department of Education in promoting Junior Scientific Endeavor.

The attitude of Mr. Skinner was excellent.

1. Mr. Baird proposed to Mr. Skinner that a central office be established where high school students might seek information concerning their discoveries and to which they might submit material for identification. Mr. Skinner indicated that the funds are not now available to aid in the support of such an office, but expressed the opinion that favorable consideration would be given the matter when funds were available.

2. Mr. Skinner agreed that the Department of Education would finance the printing and the mailing of a monthly bulletin of high school scientific work to the high schools of the state, if the Ohio Academy of Science would provide the above information, prepare the articles for the bulletin and supply the paper.

3. The Academy ought to grant Mr. R. L. Baird the authority to organize the information center and to secure the co-operation of specialists in the Academy to aid him in identifying material and preparing the bulletin. Mr. Baird's experiences with high school students who are interested in nature studies suggest that this procedure will further greatly the Junior Scientific Endeavor project.

Report of the Committee on Resolutions.

ATHENS, OHIO, April 15, 1933.

THE OHIO ACADEMY OF SCIENCE desires to express to the President and other administrators of OHIO UNIVERSITY and to the members of the local committee its grateful thanks for the hearty and cordial welcome received by its membership at its forty-thiry annual meeting.

Respectfully submitted,

EDWARD L. RICE,
F. C. BLAKE,
(H. C. SAMPSON),
Committee.

Natural Gardens.

The ecological approach to the description of the flora of any region is not particularly new. However, Doctor Wells has a fresh style of writing which at the same time appeals to the educated reader and bears the close scrutiny of the plant scientist.

As the author states in his preface, "The first part of this popular book dealing with our natural gardens is devoted to a general account of the vegetation and habitat of each of the eleven major plant communities of North Carolina. In the second part, an original artificial key to the herbaceous wild-flower plants of the state is presented, accompanied by description of the genera and important species."

The work abounds in illustrations, mostly half-tones, well-chosen and faithfully reproduced. The publication of this volume at this time is made possible through the co-operation of the Garden Club of North Carolina, to whom the book is dedicated, and to the University of North Carolina Press. The latter is deserving of praise for the attractive presswork and substantial binding of a beautiful book.—R. B. GORDON.

The Natural Gardens of North Carolina, by B. W. Wells. xx + 458 pp. Chapel Hill, The University of North Carolina Press. 1933.

APPENDIX A.

A PETITION.

To the Executive Committee of the Ohio Academy of Science, Columbus, Ohio.

We, the undersigned chemists in the State of Ohio, make a common petition to your honorable body for permission to organize a *Section of Chemistry in the Ohio Academy of Science*, viz.:

NAME	INSTITUTION	ADDRESS
William Lloyd Evans	Ohio State University	Columbus
C. W. Foulk	Ohio State University	Columbus
W. S. Frame	Ohio State University	Columbus
M. L. Wolfrom	Ohio State University	Columbus
H. L. Johnston	Ohio State University	Columbus
Wallace R. Brode	Ohio State University	Columbus
Edward Mack, Jr.	Ohio State University	Columbus
Cecil E. Boord	Ohio State University	Columbus
H. V. Moyer	Ohio State University	Columbus
J. E. Day	Ohio State University	Columbus
Marion Hollingsworth	Ohio State University	Columbus
Edward F. Wesp	Ohio State University	Columbus
G. Bryant Bachman	Ohio State University	Columbus
W. Conrad Fernelius	Ohio State University	Columbus
Wm. McPherson	Ohio State University	Columbus
Roy I. Grady	College of Wooster	Wooster
John W. Chettum	College of Wooster	Wooster
Wm. C. Dearing	College of Wooster	Wooster
Wm. M. Morgan	Mount Union College	Mount Union
L. A. Pappenhogen	Mount Union College	Mount Union
C. A. Morey	Findlay College	Findlay
Thomas W. Jordan	Findlay College	Findlay
Marion Shank	Findlay College	Findlay
M. P. Puterbaugh	Ashland College	Ashland
Paul H. Fall	Hiram College	Hiram
W. B. Bentley	Ohio University	Athens
D. R. Clippinger	Ohio University	Athens
J. R. Morton	Ohio University	Athens
F. B. Gullum	Ohio University	Athens
Clare Martin	Bowling Green State College	Bowling Green
W. E. Singer	Bowling Green State College	Bowling Green
Louis G. Veler	Bowling Green State College	Bowling Green
C. S. Adams	Antioch College	Yellow Springs
S. J. Broderick	Antioch College	Yellow Springs
P. W. K. Rothemund	Antioch College	Yellow Springs
J. W. Haldred	Antioch College	Yellow Springs
W. A. Hammond	Antioch College	Yellow Springs
John W. Barker	Wittenberg College	Springfield
A. F. Linn	Wittenberg College	Springfield
J. W. Morgan	Wittenberg College	Springfield
Henry S. Ciles	Wittenberg College	Springfield
E. D. Scudder	Youngstown College	Youngstown
W. C. Ebaugh	Denison University	Granville
W. A. Everhart	Denison University	Granville
Lottie E. Munn	Lake Erie College	Ashtabula
Gladys K. Wardwell	Lake Erie College	Ashtabula
K. G. Busch	Capital University	Columbus
Grover L. Orr	Capital University	Columbus
J. G. Ralston	Muskingum College	New Concord
P. E. Clark	Muskingum College	New Concord

NAME	INSTITUTION	ADDRESS
C. B. Rutenber	Kenyon College	Gambier
W. H. Coolidge	Kenyon College	Gambier
W. A. Manuel	Ohio Wesleyan University	Delaware
G. R. Yoke	Ohio Wesleyan University	Delaware
R. V. Sinnett	Ohio Wesleyan University	Delaware
Junia E. McAlister	Ohio Wesleyan University	Delaware
J. R. Harrod	Ohio Northern University	Ada
Robert C. Gibson	Ohio Northern University	Ada
H. C. Brill	Miami University	Oxford
C. W. Kreger	Miami University	Oxford
Carl N. Webb	Miami University	Oxford
August Fruehan	Miami University	Oxford
G. Raymond Hord	Miami University	Oxford
A. Lawrence Curl	Miami University	Oxford
C. F. Rumold	Kent State College	Kent
Maurice B. Palmer	Kent State College	Kent
A. W. Coven	Kent State College	Kent
Alfred B. Garrett	Kent State College	Kent
Clarence L. Cook	Kent State College	Kent
L. A. Weinland	Otterbein College	Westerville
A. J. Esselstyn	Otterbein College	Westerville

APPENDIX B.

RADIO TALKS.

The following is a list of the radio talks sponsored by the Ohio Academy of Science and given by members of the Academy through the generous courtesy of The Ohio State University Broadcasting Station, WEAO, each Friday, between 7:45 and 8:00 P. M. from January 6 to April 28, 1933.

January 6—President R. A. Budington, Oberlin College, Oberlin. Topic: *"Why Ohio is Interesting."*

13—Harlan T. Stetson, Perkins Observatory, Delaware. Topic: *"The Perkins Observatory as a Scientific Institution."*

20—James R. Withrow, Ohio State University, Columbus. Topic: *"What is Gasolene? From Whence Does it Come? How Manufactured, Tested and Controlled?"*

27—C. G. Shatzer, Dean, Wittenberg College, Springfield. Topic: *"The Geography of the Ohio Area."*

February 3—L. W. Taylor, Oberlin College, Oberlin. Topic: *"The Cosmic Ray."*

10—Allyn C. Swinnerton, Antioch College, Yellow Springs. Topic: *"Caves."*

17—Ondess L. Inman, Antioch College, Yellow Springs. Topic: *"The Green Leaf."*

24—Eugene Van Cleef, Ohio State University, Columbus. Topic: *"The Finns in Ohio."*

March 3—Charles A. Doan, Ohio State University, Columbus. Topic: *"The Romance of Modern Medical Exploration."*

10—Frank J. Wright, Denison University, Granville. Topic: *"The Proposed Shenandoah National Park."*

17—Allen C. Conger, Ohio Wesleyan University, Delaware. Topic: *"Snake Tales."*

March 24—James P. Porter, Ohio University, Athens. Topic: *"Recent Studies in the Psychology of Personality."*

31—W. A. Manuel, Ohio Wesleyan University, Delaware. Topic: *"Old King Coal."*

April 7—Emery R. Hayhurst, State Board of Health, Columbus. Topic: *"Air Conditions and Health."*

14—David C. Warner, Executive Secretary, State Water Conservation Board. Topic: *"Water Conservation in Ohio."*

21—Arthur W. Lindsey, Denison University, Granville. Topic: *"Human Futures."*

28—E. H. Johnson, Kenyon College, Gambier. Topic: *"Science and Reconstruction."*

BOOK NOTICES.

Hormones—the Tides of Life.

Knowledge of the complicated and interesting functions of the endocrine glands is increasing so rapidly that it is difficult for one not directly concerned in the experimental work to keep up with the advances. It is very much worth while, therefore, to have available this masterly and dispassionate account of the marvels of modern endocrinology. The layman will find it clear and readable, while the scientist will be struck with the technical implications which he can read into every chapter. It is essential that the biologist, at least, should avail himself of such guide-posts as this summary.—L. H. S.

The Tides of Life, by R. G. Hoskins. xi + 352 pp. New York, W. W. Norton and Co. 1933.

The Depths of the Earth.

This contribution to the knowledge of igneous rocks and the depth of the earth is divided into three main parts. Part I constitutes about a quarter of the book and deals with the various types and phrases of igneous rocks. Part II, which is about half of the book, discusses in detail Daly's theory of the make up of the earth. Part III, a little over a quarter of the book, considers the application of the general theory and certain rock clans. In Part II there is much speculation which is however "larded" with many facts.

To those familiar with Professor Daly's work little need be said. To those unfamiliar with his work, this is, like his other writings, both stimulating and valuable.—W. Berry.

Igneous Rocks and the Depths of the Earth, by Reginald Aldworth Daly. xvi + 598 pp. New York, The McGraw-Hill Book Co. 1933.

Historical Geology.

The third edition of Schuchert's Historical Geology is for the most part rewritten, and in this edition Dunbar is the junior author. This edition does not supersede that of 1924, although it supplements the early edition in being more up to date; it is not as technical and not quite as advanced. The handling is such that details are grouped around principles so that the student has something upon which to use the varied facts. The authors and John Wiley and Sons have given us a text which is well handled on both parts and one which should enjoy such reception as was received by their earlier efforts.—W. Berry.

A Textbook of Geology. Part II, Historical, by Charles Schuchert and Carl Dunbar. 3rd ed. vii + 551 pp. New York, John Wiley and Sons. 1933.

Presidential Address.

THE INNOCENCE AND GUILT OF SCIENCE.

ROBERT A. BUDINGTON.

The Ohio Academy of Science is now gathered for its forty-third annual meeting. If we may break away from its seriousness for the moment we may facetiously doff the present dinner occasion as its forty-third birthday party. At a time when an essentially unavoidable epidemic of township, municipal, and institutional centenaries is being celebrated, a mere 43 years makes our organization seem scarcely more than adolescent. This need not make us apologetic, however; quite otherwise, for no publicist, or other megaphone-manipulator of obvious facts fails to re-announce the well-worn doctrine that the hope of civilization is in the hands of youth. We confidently assert that the 143rd annual Academy meeting will be magnificent, far more consequential than the present occasion!

Personally, I cannot avoid wondering, very sympathetically, what subject upon which to address his audience the 143rd Academy president may select. On second thought, however, it is quite possible, probably probable, that wisdom and courage will have accumulated by that time to a degree resulting in the forbidding of this recurring speech imposition! But, unhappily for you, and for me, that date is too far in the future to get any amendment into control of the present occasion. We are both "in for it," for the next several minutes: you must swallow the "bitter pill"—and bravely attempt to keep lower jaws from dropping, as you do so, or ears from drooping!

In the earlier days, as our records show, when there was only a section devoted to biological subjects, an officer could frame up something to say along the special line of that interest. Gradually, as the accretion-like growth of the Academy has proceeded, the variety of sciences now gathered under its banner has so increased that a specialized subject is practically sure to bore a majority of our total group; hence, the Academy audience, gathered for an optional dinner, but consequently in essentially compulsory attendance on the speech following,

demands discussion of a comprehensive topic, one applying to all branches of science. I do not know when such a problem has been more successfully solved than it was by your last year's president, Professor Alpheas F. Smith. My temptation was to just read his address to you, again, this evening; we all would have been the gainers.

After not a little deliberation, mostly during last summer, I decided to adopt the subject I have, "The Innocence and Guilt of Science." For a long time I had felt repeatedly peeved, when, on occasion, in reading and in conversation, the spirit and service of science was subjected to a process of mud-throwing, and other shallow-minded abuse: everyone of this audience has felt similar resentment. Then, as the autumn came on, the newly invented words, "technocracy," "technocrat" and their ilk were foisted on an unprepared public, and the noise of their machinery became so deafening and offensive that my title was abandoned—permanently— as I thought. After a while, however—and as you know—the engineering departments at Columbia, and their collaborators, engaged in a wholly worth-while and admirable "Energy-Survey," found they had been caught unawares, sucked into a vortex; in other words, were being "strung" by a strangely clever statistical legerdemainist; they escaped from his clutches by firing him; Simeon Strunsky and others came to the rescue as meditators between the "Energy-Survey" and the public—and the situation was saved, or at least relieved. In my own predicament, as the term "technocracy" became less frequent and nauseating, courage gradually returned, my partial deliberations about the "innocence of science" were pulled out of the ashes, and are now being stuffed into your ears.

Before going further, let me undeceive anyone who imagines that science really needs any defense, or that I think so. The fact is, however, that we are often so illogical and temporarily confused that a kind of misunderstanding, or misconception of things creeps into our analysis of them. The speaker does not nurse the idea that it lies within the scope of his ability to "make the crooked ways straight, and the rough places plain." Hard work or thought after a hearty banquet like this is inadvisable (I take refuge in that theory), so I only aspire to augment your gastric satisfaction by offering a sort of after-dinner mint of not too objectionable a flavor.

The actual subject matter of science was present and has

descended to us from an infinitely remote past, of course. "Before the mountains were brought forth, or ever thou hads't formed the earth and the world, even from everlasting to everlasting," the elements of force, and of substance (if there is any such thing) were pursuing a behavior, a relationship of cause and effect, en masse, and as electrons and the like, which we little men are still puzzling over and as yet do not fathom or understand except in the most fractional way.

Science, as a *body of observed fact*, has also been in existence, "on the road," as we say, a very long time. In the sense in which the term is generally used, however, it can hardly be dated back to a beginning antedating the arrival of more-or-less intelligent man; for, like sound, it does not exist save as an experience of man, to which the term is applied. Needless to say, the *facts of nature*, all its bases and laws as we call them, have existed and been in operation ever since eternity began, if we may use that paradoxical phrase; while *Science*, which etymologically implies "things known," or knowledge, presupposes a knower; and any critically recognized, and organized, and appreciated body of facts we believe to be the possession and experience of only the one genus, Homo. Perhaps so far as evidence goes, we should concede to the Neanderthalers the credit for being the earliest observers, the earliest formulators of scientific knowledge, and the earliest ones to use what we think of as "applied Science;" in other words, they were the first "technocrats." The scientists among them recognized the seasons, no doubt, correlated with differing lengths of day and night or the dropping of leaves from deciduous trees as the frosts came on; the fact of gravity as revealed by weight of rocks and limbs and the running down hill of water; they knew the cleavage qualities of flint stones; the principles of balance and symmetry in their arrows and spears; they must have known much of anatomy of the animals they killed and ate; and doubtless something of the therapeutic values of the bark and leaves of particular kinds of trees, or herbs.

From still another angle, science, as *organized knowledge*, is thought of as emerging from the limbo of a less remote past, i. e., Homo, or Homines, made deductions, or practical applications along lines which have definitely come down to us in recorded language. Approximately, astronomy dates from Thales (650 B. C.?), who determined the length of the year and studied eclipses, and Anaximander (611 B. C.) who invented

the sun-dial. Anaximander is also one of the fathers of geography, in that he made a map of the world, however erroneous it was. He also took a hand at biological philosophy and framed up a "theory" of evolution. Pythagoras, also of the 6th century, B. C., reasoned the earth to be spherical, and, as a related subject, formulated many important mathematical theorems. Xenophanes, a contemporary of Pythagoras, was one of the earliest palaeontologists. Leucippus, whose dates are obscure but probably in the fifth century B. C., practically comprehended the atomic theory. Hippocrates the 2nd (460 B. C.) was the first real pathologist. Plato (429 B. C.) was one of the earliest to see the overlap of natural science on philosophy, and his pupil, Aristotle (384 B. C.) was the father of zoology, though he should also be accorded paternal relation especially to astronomy, including meteorology. Theophrastus, Aristotle's pupil, with his description of more than 500 species of plants, merits being called the "pater noster" of botany, while Archimedes, of the third century, B. C., the great student of inclined planes and thus the inventor of the screw, is one of the earliest devotees of mechanics.

Now, I have cited the above samples from the archives of scientific history purposely. Ah, those were the "good old days," when the motive of men who dealt with nature was pure and undefiled by any thought of the practical applications, the selling values of their discoveries, the temptation to take out patents, the dreams of recognition. Yes, those men, along with their contemporaries and followers for a few centuries, were real scientists: their interest was spontaneous, they were impelled by no inferior motives; their results were accepted as interesting, and, while not unchallenged, they were respected as scholars, as contributors to the general welfare of mankind. They studied Nature for its own sake; yes, "Those were the good old days!" I remind you of these men, their work and their place in the history of science because such reference furnishes a basis for a first articulation with the subject chosen for this talk.

No field of intellectual interest and endeavor has been subjected to such a deluge of earnest opprobrium and unqualified reproach, especially during the last fifteen years, as has science. At its feet has been laid the major responsibility for most of the present misery of mankind the world over. It is blamed for the very possibility of war, in large

measure, of course, because of the instruments of war—mechanical, chemical, bacteriological, and for the consequent endless complexity of international relations, indebtedness, and the uncertain character of the centuries ahead. It is blamed for the possibility of easy and rapid production, and thus of over-production; for the consequent unemployment situation and its accompanying human misery and staggering sociological problems; for the one-time disruption of the horse-breeding, wagon, and coach industries; later for the dismantling of unnumbered thousands of miles of electric railways, and now for the actual or approaching bankruptcy of our steam-railway systems. Science is held accountable for the relative ruin of the wool industry, the silk industry—while the recent revelation of the inherent possibilities in the nettle is proclaimed as fatal to half the total textile industry of the world. Large sheaves of further verdicts have been voted by the jury of our fellow-men, who have been bamboozled into thinking that the newly-born cult of technocrats is identical with the quiet associates in scientific research. This charge such a group as the Ohio Academy of Science, and all other similar organizations, as such or as individuals, vigorously resents. In saying this the defense is made, of course, on behalf of science as such, i. e., *pure science*, and on behalf of those who work in the spirit of Thales, and Hippocrates, and Leucippus: there is not in mind the application of scientifically established facts. True scientists "do not simply handle phenomena and describe or utilize them for some practical purpose, but explain them and show their correlations." This distinction has been further well pointed out by the late Thomas Hunt Montgomery.[1] He says:

"There is an enormous mental difference between the pure technologist and the pure scientist. We do not wish to imply, for instance, that the mind of the pure mathematician is higher than the mind of the engineer, for they are rather complemental; but the former is a scientist and the latter is not, in that the former seeks interpretations and the latter applications. A physicist is scientific so long as he keeps in mind explanations, but not when he simply constructs apparatus. In the same way there are two very different kinds of men interested in the microscope: one constructs it, but he is not a

[1] T. H. Montgomery: "The Aesthetic Element in Scientific Thought." Annual address by President, Texas Academy of Science, 1905.

scientist no matter how excellent a technician he may be; the scientist is he who patiently reasons and imagines with his eye at the ocular. There is an enormous difference between the technical expert and the scientific interpreter, for the first builds apparatus, makes use of phenomena; while the second tries to relate the phenomena and bring them together into certain broad generalizations. If there is a particular group which may be sharply defined, it is the group of minds interested in mechanical constructions. But it is an egregious error to rank these and scientists together: they are rather to be considered as entirely divergent both in work and aims. Scientists need to use apparatus, they are obliged sometimes to invent it; however, this apparatus is not of primary interest to them, but simply a tool: they look ahead, far beyond the means employed."

The foregoing thesis could be supported by innumerable illustrations. Columbus was completely possessed by the then-theory that the world is spherical, and that India could be reached by sailing westward as well as eastward; he saw many evidences in support of his theory; he wanted to establish the fact; he was not at all primarily interested in buying and selling Indian goods. He blundered into America, and proved it to be a fact; but no one thinks of blaming poor old Columbus for the rise and fall of Florida real estate, or for the administration of Jimmie Walker, even if they have occurred in the field of his discovery.

Among his innumerable other accomplishments, Benjamin Franklin flew his kite and toyed with lightning; but no poor devil has yet blamed him for the electric chair. Llewenhoek is not accountable for the inhuman use of bacteria in war; it's not the responsibility of the Wright Brothers that Lowell Bayles met his death at the Detroit Flying Field; Street (1794) committed no crime because your internal combustion engine responded to your foot as you got sleepy and smashed your auto against the telephone pole. Conversely, pure scientists must forego the credit which is due the inventors and the technologists for assembling their results into the innumerable forms which bless mankind. Their turning of laboriously-won scientific facts into such combinations and machine-forms as can serve useful ends is a wholly laudable occupation in its own right, but it is nevertheless true that the bona fide scientific investigator and the inventor of commercially saleable utilities are seldom combined in the same person. Insight and brilliancy

in one of these occupations is generally associated with mediocrity, or less, in the other. Nevertheless, it is probably true that a majority of people, not a few scientists included, fail to discriminate clearly between these two mental powers, and confuse the scientific investigator with the technologist; such are numb to the shifting of their intellectual currents, e. g., as they pass from the data of the physiological chemist and chick embryologist to those of the incubator manufacturer; from the laboratory of Professor John Abel, the isolator of epinephrin, to the factory for making chocolate-covered pills; from the laboratories of Klebs and Loeffler to the bottling department of Sharp and Dohme, or Parke Davis & Co.; from the synthesis of nitroglycerin to the dynamite factories of the DuPonts. The phenomenon of a combination investigator and inventor, as has been intimated, does occasionally occur as a "rara avis." One at once cites the accomplishments of Edison, and, long before him, Watt. But they are exceptions; as a rule, a man is Dr. Jeckyl, let us say, most of the time, and only momentarily Mr. Hyde, or vice versa.

Appealing again to an authority whose words will multiply the seriousness of my contention many-fold, let me quote from one of America's one-time great mathematical sons, Simon Newcomb.[2] At the opening of the International Congress of Arts and Sciences at the Universal Exposition in St. Louis (1904), he said, in commenting on the remarkable achievements of the 19th century, "The superficial observer, who sees the oak but forgets the acorn, might feel as though the special qualities which have brought out such great results are expert scientific knowledge and rare ingenuity, directed to the application of the powers of steam and electricity. From this point of view, the great inventors and the great captains of industry were the first agents in bringing about the modern era. But the more careful inquirer will see that the work of these men was possible only through a knowledge of the laws of nature, which had been gained by men whose work took precedence of theirs in logical order, and that success in invention has been measured by completeness in such knowledge. While giving all due honor to the great inventors, let us remember that the first place is that of the great investigators whose

[2]Simon Newcomb: "The Evolution of the Scientific Investigator." Opening address, International Congress of Arts and Science Universal Exposition, St. Louis, 1904.

forceful intellects opened the way to secrets previously hidden from men. Let it be an honor and not a reproach to these men that they were not actuated by the love of gain, and did not keep utilitarian ends in view in the pursuit of their researches. If it seems that in neglecting such ends they were leaving undone the most important part of their work, let us remember that nature turns a forbidding face to those who pay her court with the hope of gain, and is responsive only to those suitors whose love for her is pure and undefiled. Not only is the special genius required in the investigator, not that generally best adapted to applying the discoveries which he makes, but the results of his having sordid ends in view would be to narrow the field of his efforts, and exercise a depressing effect upon his activities. The true man of science has no such expression in his vocabulary as 'useful knowledge.' His domain is as wide as Nature itself, and he best fulfills his mission when he leaves to others the task of applying the knowledge he gives to the world."

It seems certain that scientists for all time will find one of their great exemplars and inspirations in Louis Pasteur. Unsurpassed in his scientific methods and accomplishments, he was likewise clear-thinking and high-minded in his devotion to his calling as investigator. The anecdote is familiar: offered the post of national supervisor of the silk industry at a then-princely salary per year, he declined, remarking that "such a step would be beneath the dignity and calling of a scientist." In modern parlance, he declined the calling into technocracy!

Whatever the guilt which may attach to the devises called instruments of war, whatever the results of machine invention and machine production, whatever the credit for undreamed speeds of communication and travel, whatever the future of radio and television and air travel—pure science can deny the guilt, and must forego the credit: her dealings were and are with the fundamentals, not with devisings, or recombinations, or with any of the honorable or wicked applications of the technocrats. Her province is with the facts of nature, the facts as they are, and were, untold ages ago: the facts as they were in the proterozoic, the palaeozoic, mesozoic, and cenozoic—long before man was here to observe, and longer before he invented anything.

And here our discussion blends into the second of three of the suits often brought against science, and about which

I am venturing to say something this evening. I refer to the specific or implied injury which scientific revelations have presumably done to different theories as to the nature of things, to long-held and preciously-valued personal philosophies, to ecclesiastical tenets or creeds, and consequently to human peace-of-mind and serenity. In so far as these last have depended on unfounded tradition, on mere usage, on superficial custom and habit, on superstition, on assumed revelation or inspiration in the field of ideas and beliefs, or on childish preferences, the contentions, i. e., the truths which have been established by science, may easily have been damaging, and deep wounds have hurt. The claim is usually advanced that science has concocted new facts, created laws de novo, out of its own powers and suitable to its own whims, in part, even, mischievously: it has toyed with the holy and sacred.

Such as see the matter thus must reflect that truth never changes, that the facts of science are not new, but eternal. They should slowly read the words of that poetic thinker who, in the opening words of a sonnet, has said:

> "Fear not to go where fearless Science leads,
> Who holds the Keys of God. What reigning light
> Thine eyes discern in that surrounding night
> Whence we have come . . .
> Thy Soul shall never find that wrong is right."

Put in other words, Ecclesiasticus need not worry about true scientists when he says, "That which hath been, is that which shall be: and that which hath been done, is that which shall be done: and there is no new thing under the sun." Scientists realize those facts already: they are simply that minority of people in general who feel the universe as a whole, and the minutiae, even to the size of electrons, to be genuinely interesting, and spontaneously give their time and strength, their lives, to finding out not new things, for there are none, but rather facts and relationships which have never been noticed or formulated before.

Thus while the scientific group in the first place resents the charge that its members are identical with the inventors and technologists, they, in the second place, vigorously resent the accusation that they create new forces, either as allies of the evil one or as collaborators with Almighty God. If they pray at all, it is in these words: "Open Thou mine eyes that I may see,"—the facts and the laws of the ages.

May I comment briefly on one other of the numerous criticisms not infrequently voiced as judgments against science? Rather than attempt to define or describe its nature, let me quote:

> "Every province of human interest has been brought under scientific classification, so that nearly all thought is now cast in 'general ideas.' This mode of thinking ignores individuality and sees in men and things only units of a class. For this reason, man is content with countless repetitions of the same form because his class idea is realized if it find in each object the few characteristics common to the group."

After citing a few examples by way of illustrating the foregoing contention, the commentator continues:

> "The world has been filled with these ugly forms made in the name of art, but they only bear witness that science has subdued the earth and now holds undisputed sway."

Then he adds as a separate paragraph:

> "Not only has it driven art into the background, but it has misrepresented its character."

And further on:

> "As I have said above, science is largely responsible for the widespread misconceptions of and indifference to art."

Let me at once add that the context of the above quotation fully explains that the writer does not mean that science is anything less than invaluable in its own way. He does mean that a body of students who have been disciplined in the precision methods of science are perhaps permanently injured as to their easy grasp of the highly visionary and imaginative practices which are vital to the artist. While trying to estimate the degree to which science is thus innocent or guilty as regards the fine arts, one must not forget that they have very different goals, at least when one has in mind the ultimate ambition of each. They do not pretend to be more than supplementary to each other, or to coincide save with respect to the most elementary beginnings of each. In all their separately diagnostic features, they strive and operate in very different fields,

with different ends in view, and make very unlike contributions to the mental and spiritual life of man. Art is characterized by breadth; generally by mass effects: it feeds the spirit of man, it works through his emotions, it amplifies his vision, and enlarges his soul by bringing his imagination into play. In a degree which statistical data could never secure, art lets a person attain a depth of feeling and appreciation which he would otherwise never experience.

The method of science, on the other hand, uses the mind as a tool, and by insistence on precision, on uniformity, on endless repetition and calibration, it brings about a state of mind which demands absolute and generally tangible truth, so far as this is humanly attainable: it engenders a dislike, an intolerance of haze and fog, of crude approximations, of half truths: dreams have little place in the disciple of science. In all these ways, then it must be conceded that the precision of science not only does not contribute to imaginative art, but, in a real degree, fosters a spirit which is inimical to art.

But, so far as guilt is to be assigned, so far as responsibility in the matter goes, is it not a matter of exchange of courtesies? Each of these fields of human interest and devotion says to the other, "The same to you, my dear Madam, or Sir!" This must have always been so: for even the deference which must be given to age hardly plays any part here, so ancient are both habits of human thought. The "general, inclusive effect" which art seeks, is hardly less than an abhorrence to science, and the exactness of science stands in the way of emotional art. The artist throws himself, his very soul, into the picture or the statue—his result is an alloy of his imagination, his vision, his materials and tools, and himself: on the other hand, the product of the scientist must be unbiased, impartial, impersonal, concrete.

Fortunately, human interests are hybrid to such degree that both art and science can be understood, and tolerated, and fostered in the make-up of the single individual. This is an instance of dual-personality, and caution should be exercised lest we let either the play of imagination and vision, or the insistence on accuracy be crowded out by, or confused with the other. It is fortunate, let me say further, that, "in spite of ourselves," we constantly experience and earnestly propagate the instinct which enjoys art on the one hand and simultaneously insists on scientific accuracy.

In a not too clear-cut way, I have tried to designate three of the commoner articulations with human affairs at which science is often called into court as an offender against the material, or intellectual, or spiritual welfare of human kind. As regards the first, we insist that there is a clear distinction between the investigator and discoverer of elemental truth, the truth which resides in the nature of things, and the person who makes permutations and combinations of the facts seen first by the true research worker, facts sought and found for their own sake. The technologist depends on the research worker for the secrets on which his devises rest, but the scientist may not be held responsible for either the good or evil, or the number of machines his brother-inventor creates.

As regards perversion of man's intellectual integrity, the accusers of the scientific observer as an agent in compelling them to modify their long-established opinions, in any field whatever, must always be admonished that America was here millions of years before Columbus discovered its shores: that there is nothing new under the sun: truth is eternal. It is not changed by shutting one's eyes to it, it is not created by any man, scientists or otherwise; but the soul of no man was ever washed and saved by stubborn attendance at the shrine of ignorance.

In the third place, while man's spiritual nature is not amenable to calculation or measurement, or reducible to formula, while it does leave solid ground and fact, and finds easier expression in the unconfined methods of art, where the limits imposed by experienced truth do not hold, we should not feel that art and science are contending for the same territory in human nature. Each in its place, art giving *vision*, and science *precision*, as has been said, are each vital constituents of man's every-day needs.

Finally, while fully aware that, as in the human body many a structure besides the heart or brain is easily a vital organ, so in the material, and intellectual, and spiritual departments of our lives we needs must feed in green pastures of various sorts, and draw inspirations and satisfactions from many different fields; yet, on the present occasion we pronounce our belief in the innocence of pure science and its motives: our emphasis is on the unlimited contribution which science makes to human thought and philosophy: and we endorse the words of John Dewey, when he says, "The future of our civilization depends upon the widening spread and deepening hold of the scientific habit of mind."

THE COST OF SOIL EROSION.*

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THE PROBLEM.

Unrestrained soil erosion is rapidly building a new empire of worn-out land in America: Land stripped of its rich surface layer down to poor subsoil, and land gullied beyond the possibility of practical reclamation. This wastage of the nation's most basic and indispensable asset is not merely continuing; it is speeding up. Over millions of acres the washing is becoming more rapid as the cutting away of the upper soil material lays bare the less stable substrata. Every rain heavy enough to cause water to flow across cultivated slopes and sparsely vegetated land removes part of the soil. Every one sees this in the muddied waters flowing away to the oceans, but few think of the material that discolors these flooded waters as soil material swept from the surface of the fields, where lies the most productive part of the land.

No other agency or combination of agencies remotely approximates the impoverishing effect of rainwater running wild across the slopes of America's farm lands. Three-fourths of the agricultural area of the nation is sloping enough to favor ruinous cutting away of the vital substance of the soil through the abrasive action of water. More than 100 million acres of the 350 million in cultivation have lost all or most of the precious material we call the topsoil. At least 160 million acres of the remainder are suffering in some degree. To date we have permitted the essential destruction of about 35 million acres of what formerly was largely good crop land, together with an enormous additional area of grazing land. This has been so deeply washed, so cut to pieces by gullying or so smothered with the products of erosion that it can not be reclaimed upon any practical basis by the average farmer. Much of it is permamently destroyed. Bedrock has been reached in countless places and deep gullies have torn asunder millions of sloping acres. All of this has been abandoned.

*Read at the General Meeting of the Ohio Academy of Science, April 14, 1933.

No other part of the western hemisphere has been so wasteful of its land resources as we of America. Probably no nation or race of all history has permitted its agricultural lands to go to waste so quickly. Other parts of the world have been ruined by erosion, but the lands were used for many centuries, even thousands of years, before their devastation was completed. The enormous impoverishment and destruction that we have permitted, even encouraged by lack of interest and foresight, has taken place with but two centuries of cultivation. Most of the depletion has been accomplished during the past fifty to seventy-five years. This has come about because of carelessness, ignorance and the physical peculiarities of our soils, rainfall and farm methods. With respect to land use, we have proceeded, and continue to proceed, without plans. We have used all kinds of land, occupying every degree of slope, indiscriminately for every conceivable purpose. There has been too little of orderly selection on the basis of adaptability and fitness, and almost no effort has been given to the vitally important matter of soil conservation. We have looked upon our vast domain of agricultural land as limitless and capable of enduring forever. Because the vast areas which have been made so poor that a man may spend his lifetime upon it without bettering himself or his farm will still grow something, we continue to produce an abundance of everything. The point of gravest menace is not a matter of producing a sufficiency of food. We shall be able to meet our requirements of both food and clothing for many years to come. But how? What is the menacing aspect of this evil of erosion?

The sore points deserving immediate serious consideration are these: Our best lands are largely in use and have been for some time. The area of these more favorable soils is steadily diminishing as the result of excessive rain-wash. Acreage yields are declining in spite of all the education and experimentation devoted to improvement of methods, and in spite of increased use of improved varieties, better seed, better machinery, high-grade fertilizers, soil-improving crops and irrigation, along with continuing abandonment of worn-out land for land still retaining its topsoil. Cultivation of erosion-exposed clay is more difficult and costly, and need for fertilization and building up of the soil is steadily increasing. Water flows across the impervious clay exposed by the stripping off of the mellow, humus-charged topsoil more rapidly to augment

floods. Tens of thousands of hard-working farmers already are subsoil farmers. Subsoil farming is an impoverishing type of agriculture. Although producing a large aggregate of crops, the average yields at this low level of soil productivity are so pitifully meager, there is but slim opportunity for the operator to get ahead, whether prices are up or down. Reservoirs that were built to hold water, not solid soil material, are rapidly filling with mud washed down from unprotected slopes; stream channels are silting up and overflows are becoming more frequent and destructive. Vast areas of alluvial land of extraordinary original productivity are being covered with infertile sand and gravel; large sums are required to protect the embankments and roadside ditches of our highways and railroads; and flood protection calls for the expenditure of ever increasing millions.

From every conceivable angle erosion is a devastating agency. It is the greatest thief of soil fertility. It steals not only the plant food contained in the soil but the whole body of the soil, plant food and all. When this productive material that required centuries in the building is washed out of fields it can not be economically hauled back, even where it is washed no farther than from the upper to the lower slopes of fields. That which passes down into the beds of streams and on out to the ocean is lost as irretrievably as if consumed with fire. Our best estimates indicate that erosion steals 21 times as much plant food as the crops take out of the land. That removed by crops can be restored, but that taken by water and wind can not be restored. It is a net loss of almost incalculable magnitude. The process is the principal cause of worn-out land. There can be no permanent cure of dangerous floods so long as this principal contributor to the evil remains unleashed. Higher and broader and more costly levees may be built, but they can not insure any permanency of protection with ever increasing volumes of water charging out of erosion-denuded uplands.

Our surveys and soil-loss measurements indicate that at least 3,000,000,000 tons of soil are washed out of the fields and pastures of the United States every year. The value of the plant food contained in this amounts to more than two billion dollars, on the basis of the cheapest fertilizers. Of this almost inconceivable wastage, the direct loss to the farmers of the nation is not less than $400,000,000 every year. This is

paid for in reduced acreage yields, increased cost of cultivation, fertilization and the growing of crops for the sole purpose of building up impoverished fields, in land abandoned, highways damaged, reservoirs, irrigation ditches and culverts choked with erosional debris, and accumulative thinning of the surface soil, the staggering cost of which is postponed until the last inch of soil is washed off.

In a single county of the old South Carolina Piedmont country, where farming has gone on for nearly two centuries, ninety thousand acres of once good farm land have been mapped as soil largely permanently destroyed by gullying. Countless ravines have chiseled to pieces former fields, exposing bedrock in numerous places, and all the soil has been lost. One farm of 1,004 acres, 200 of which were cleared of the virgin timber just after the Civil War, has not so much as a single acre of good farm land left in one place. No one lives on this once magnificent plantation. The palatial residence has tumbled to ruins. Silence pervades the desecrated acres; and all the surrounding country is much the same.

The same survey has shown in the same county forty-six thousand acres of stream bottom, formerly the best land of the entire state, which have been converted into swamp or so smothered with sand washed out of the hills that it no longer has value for crops. The stream channels are so choked that every rain of any importance sends flood waters over the alluvial plains.

Eight miles west of Lumpkin, Georgia, is the largest man-made gully of the western hemisphere. This chasm is 200 feet deep. It was started by the drip from the roof of a barn fifty years ago. Since then it has swallowed the barn, a schoolhouse, a tenant house and a graveyard with fifty graves. In addition to this huge gulch, there are thousands of others nearly as large. Altogether seventy thousand acres of the best farm land of the region have been permanently destroyed in one county by this irreparable devastation. To fill these gullies would require operations on the order of those employed in the construction of the Panama Canal. And yet, every one of them could have been stopped easily in their infancy, had the farmers known of the necessity and of the practical methods of procedure.

In five adjoining Alabama counties, 500,000 acres of formerly cultivated land, most of it once highly productive, have been

worn out with gullying and deep sheet washing. This is largely abandoned. Fortunately, much of it is growing up with pine trees. The growing of trees is the best possible use for such land.

In one county in southeastern Ohio, a soil survey made by the State and Government cooperating shows that nearly 200,000 acres of formerly cultivated land are no longer cultivated. Approximately half of this has been so terribly impoverished by erosion that it is no longer used for any purpose. First it was farmed, then turned over to pasture; now the fences have fallen down and only poverty grass, goldenrod and weeds are growing on it. This too could have been saved had the farmers known 50 or 75 years ago what we know today.

That the consciousness of the nation has not been aroused to the seriousness of this prodigiously costly evil is an ugly blot upon our record. In our textbooks we read of vast expanses of grass-covered prairies, of the buffaloes that grazed over these virgin grasslands; and we read of the enormous extent of our eastern forests and the fertile lands from which these have been cut. But we read little or nothing in these volumes of the desecration of these same areas following the breaking of the prairie sod and the cultivation of the lands that supported the forests; the destruction of millions of acres and the impoverishment and increasing impoverishment of a large proportion of the remainder. Are our children to believe that the present gullied and soil-skinned slopes of the nation represent normal conditions, or shall we tell them the truth in order to implant the germ of moral obligation to country and posterity which eventually would arouse that mobility of consciousness so vitally necessary for correction of our unwise land-use practices. If this is not done, if we continue as in the past cultivating steep lands and lands that wash away within a few short years following the first plowing, there can be but one outcome: Irreparable decline of the nation's most basic resource, its agricultural lands. This is not so much a prediction as an obvious physical eventuality based on the known depth of the productive topsoil and the known rates of soil removal and depletion by erosion.

At the moment there is widespread discussion of the evils of erosion and the necessity for controlling it. Some of these discussions seem to imply that all we have to do is to go out

and stop the wastage. We are fully aware of the fact that forests and grass and the thick-growing plants, such as lespedeza, alfalfa, sorghum and sweet clover, will largely reduce the washing; but we must continue to produce clean-tilled crops, as corn, potatoes, cotton and tobacco. It is in fields of these crops that the evil is so vicious and calls for immediate attention. There are various remedies and partial remedies. Some methods, effective on one soil occupying a given slope, are of little value for other soil conditions. For many kinds of land we have not yet ascertained the most economical and effective measures of control. The national program of soil erosion, described below, is striving with the greatest possible speed to develop the acutely needed methods for such lands.

In the discussions now going on a great deal of emphasis is devoted to gully control. Much good could be accomplished in this direction, especially in regions where gullying is widely prevalent; but on the whole necessity for gully control is of inconsequential importance in comparison with the need for control of sheet washing: That process of erosion which planes off a thin layer of soil with every rain heavy enough to cause water to flow across cultivated slopes. This process goes on so slowly that little attention is given it until infertile spots of clay subsoil and solid rock begin to make their appearance in fields, at which stage it usually is too late to do very much in the way of soil conservation, the soil having largely floated away in the direction of the oceans. Gullying usually begins at that stage of sheet washing when the soil is all gone.

Another unfortunate feature in connection with the erosion problem is that only a handful of soil specialists know how to distinguish sheet washing and to measure its effects. Practical capability in this important field calls for special knowledge of soil varieties, their morphological structure under virgin and cultivated conditions and their varying tendency to wash, as determined by soil type. Sheet erosion can be identified and its effects measured only by comparing eroded areas, soil layer by soil layer, with the original condition in woodlands and grass-covered areas. What will happen to a given area of a definite soil type if put into cultivation can be predicted only through this method of comparing and interpreting natural and abnormal soil conditions. What one kind of soil will suffer on a given slope frequently is entirely different from what will take place on another soil having

precisely the same gradient. This is one of the most fundamentally important aspects of the erosion problem, and without due consideration of these variables, erosion-control programs will suffer or come to nothing.

THE NATIONAL PROGRAM OF SOIL AND WATER CONSERVATION.

Finally recognizing the enormous cost of soil wastage by erosion and excessive loss of rainwater as runoff from unprotected cultivated slopes and from overgrazed ranges and pastures, Congress three years ago appropriated funds to begin a national program for studying the whole problem of erosion and for developing methods of control. The plan calls for accurate measurement of the losses of soil, water and fertility from various slopes undergoing different cropping treatments throughout twenty odd major regions of the nation where erosion is known to be a problem of enormous seriousness. To date, ten of these erosion experiment stations have been established.

At these stations every promising practical method for slowing down erosion is to be tried out on a field scale. Rates of soil loss and runoff are to be accurately determined from the different slopes planted to different crops and tilled in various ways. Terracing, strip-cropping, scarification of the land and other methods are being tried out, first on small plots and then in large fields, wherever the results have shown any promise of practical applicability. In some regions where livestock farming is important the land is being subjected to various conditions of grazing, in pastures containing a variety of grasses and other forage crops. The cheapest methods of reclaiming erosion-worn land are being determined, together with the cost. Various methods of gully control are being tested, using living dams of grass, trees, shrubs and vines, rock dams, dams made of poles, brush and other cheap materials. Conservation of the remaining soil, however, will be the prime endeavor of the program, rather than reclamation of depleted land.

As soon as the work at the stations gets well under way, every experiment of worth-while promise will necessarily constitute a demonstration. Field meetings are held on the farms at frequent intervals so that the farmers of the region may visit the station and see what is going on. The educational

phase of the work is being pursued in such manner as to acquaint the regional farmers with the precise meaning of erosion, its cost and the best methods for its control. There is no secrecy about any part of the program. Visitors are urged to come to the station from the very beginning of the work. They are urged also to bring to the specialists on the erosion farms any suggestions they may have which are based upon worth-while practices on their own farms, in order that every promising practice may be brought clearly out before all the farmers of the various regions.

To cite the work at one of these erosion farms: The Red Plains erosion station near Guthrie, Oklahoma, is located on the principal type of farm land in this highly erosive region, which comprise thirty-six million acres in Oklahoma and Texas. An erosion survey recently completed by the Oklahoma Agricultural College has shown that of the sixteen million acres under cultivation in that state, thirteen million acres are suffering seriously from erosion, nearly seven million acres of this having reached the stage of gullying. More than a million and a half acres have been ruined by deep washing and gullying during the past ten years. The annual cost of erosion to Oklahoma has been estimated by the state agricultural specialists to exceed $50,000,000, under normal price conditions with respect to farm commodities.

The work at the Red Plains station has shown that when the principal regional crop, cotton, is grown continuously, the loss of soil from the average slope amounts to 32.5 tons per acre per year, along with a loss of 14 per cent of the total precipitation as runoff. This means that under cotton only 30 years are required to wash off the entire depth of the surface soil, down to stiff clay subsoil, which produces less than half as much cotton as the uneroded topsoil.

The results show, on the other hand, that on precisely the same kind of soil and the same degree of slope only .03 tons of soil and 1.7 per cent of the precipitation are lost where grass is grown. In other words, grass reduced the soil loss by 1,080 times and the water loss by 8 times. Where cotton is grown in rotation with grain and a leguminous crop, the loss of soil is reduced by 350 per cent and the loss of rainfall by 23 per cent, as compared with the losses under continuous production of cotton.

Beyond this, terracing and strip cropping have very largely reduced the erosion. The farmers of the region are visiting the station daily, and more and more of them are putting into practice the soil-saving and water-conserving methods which have been worked out on soils like those on their own farms.

The work, such as is proposed for the erosion stations, should have been begun 50 or 75 years ago. At this advanced stage of our civilization we have not yet obtained the fundamental facts relating to the erosion problem, such as are vitally necessary for the carrying out of protective measures. If this work should be delayed the problem of erosion control would simply become progressively more difficult, more expensive and more discouraging. It is a problem that must be attended to now, not something that can be put off for future generations to solve. No moratorium can be declared against erosion. It must be fought with determination and effective implements. If we refuse to ascertain what these implements are, then the fight will be lost, or seriously retarded, farming on sloping land will become steadily less profitable and finally altogether hopeless. Floods will flow down the rivers of the nation in ever increasing volume. Cooperation from every thinking individual is needed in this combat. Let's remember that erosion is the most powerful agency affecting the physical character of the earth, and let's not forget that already we are very late in getting started the studies which should have been made first of all, the studies having to do with land use and the maintenance of soil productivity. We can not afford not to pursue this problem with all the energy at our command.

Human Reproduction.

Sex and its manifestations in man have been traditionally subjects of taboo. Science, which is coming into its own these days, recognizes no forbidden subjects, and acknowledges no taboos. This complete and extremely interesting account of the biology of sex in man fills a long-felt want, both for the biologist himself and the general public. Questions everyone has wondered about are answered here: hermophroditism, the hormones influencing sex, twinning, embryologic abnormalities and others. The book is a scholarly and dispassionate account of a difficult subject, and the author and publishers deserve a vote of thanks for the work. Abundant illustrations tell their story as no written words could, and add greatly to the value of the book.—L. H. S.

The Science of Human Reproduction, by H. M. Parshley. 319 pp. New York, W. W. Norton and Co. 1933.

THE STRUCTURE OF THE DIGESTIVE SYSTEM IN BOLITOTHERUS CORNUTUS.

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Several specimens of the forked fungus beetle (*Bolitotherus cornutus*) were obtained in April from woods in Hancock County, Ohio. At the suggestion of Dr. C. H. Kennedy a study of the internal morphology of this species was undertaken. All of the individuals collected in the spring were scattered underneath the bark of fallen logs on which was growing the large wood fungus (Polyporus). The beetles were in a state of hibernation. When the woods were again visited on July 30, specimens were obtained at the base of the fungus on stumps rather than on logs. The beetles brought into the laboratory in July were much more active than those taken in April. Larvae were present in the fungi both in April and July and although none were reared they were probably the larvae of this fungus beetle. A few eggs were laid in the laboratory by the beetles collected in July.

Bolitotherus cornutus, of the family Tenebrionidae, is common in Northeastern United States and Canada. The whole surface of the body and wing covers are very rough and there are two prominent horns on the prothorax, those on the male being much longer than those on the female.

These individuals are dull black in color and resemble a small piece of bark. They are approximately 9 mm. long and 5 mm. broad.

Specimens were kept alive in the laboratory by feeding them moist pieces of fungus. They were studied immediately after killing and the material which was to be used for sections was fixed with Kahle's fixative fluid as soon as the parts could be dissected in normal salt solution. Sections were cut from 6–10 microns in thickness. Some were stained with haemalum and fast green, others with Ehrlich's hematoxylin and Biebrich's Scarlet. The chitinous linings, cell walls, and cytoplasm were clearly stained by the fast green. The haemalum proved to be an excellent nuclear stain for this beetle.

The author wishes to express her thanks for the helpful suggestions and criticisms of Dr. C. H. Kennedy, under whose direction this study was made, also to fellow students for assistance in collecting and for suggestions in laboratory methods.

GROSS ANATOMY OF THE DIGESTIVE TRACT.

General Discussion.—The alimentary canal of *Bolitotherus cornutus* is a somewhat convoluted tube of approximately 25 mm. in length, that is almost three times the length of the beetle itself. It is divided into three chief regions, the fore-intestine (Stomodaeum), mid-intestine (Mesenteron or Ventriculus), and the hind-intestine (Proctodaeum).

The Gross Structure of the Fore-Intestine.—The fore-intestine is very short, being 3 mm. in length. It is composed of the pharynx, oesophagus, crop and oesophageal valve. (Plate I, Fig. 1.)

The *pharynx* extends from the mouth as a straight tube, having muscle attachments radiating out from its surface and connecting it with the head capsule.

The oesophagus continues as a narrow tube from the pharynx and terminates by a slight enlargement, the crop, in the center of the prothorax.

The oesophageal valve, a slight constriction marking the end of the fore-intestine and the beginning of the mid-intestine, is for the most part hidden by a wide circle of pipilliform crypts at the front end of the stomach. These crypts are longer than those found further back on the mid-intestine. (Plate I, Fig. 1.)

No salivary glands were found.

The Gross Structure of the Mid-Intestine.—The mid-intestine, or stomach, comprises the largest part of the alimentary tract, being 12 mm. in length. (Plate I, Fig. 1.) It extends from the oesophageal valve posteriorly as a straight tube for a distance of about 7 mm. Here it is 2 mm. in diameter and tapers for the rest of its length, being about ½ mm. in diameter for its posterior 5 mm. It is somewhat convoluted, bending upon itself and then extending cephalad. It is terminated by the pyloric valve and the malpighian tubules. There is a very interesting arrangement of the pipilliform crypts on the surface of the mid-intestine. Following the wide circle of crypts at the extreme front end of the stomach, there are six longitudinal rows for the anterior 7 mm. and four longitudinal rows for the remaining posterior 5 mm. In some other species of beetles it is noted that the crypts are scattered irregularly over the surface of the stomach and even in some they do not extend through the muscle layers to the surface.

In one of the specimens which was obtained in April and kept in the laboratory until June, the anterior end of the stomach was infested with fifteen Gregarines. All but one of the individuals examined in August from the July 30th collection were also infested. They were visible as white blotches through the wall of the stomach and quite well outlined against the dark fungal material which had been injested. Is it possible that they aid in the digestion of the woody fungus?

The Gross Structure of the Hind-Intestine.—The hind-intestine is composed of the pyloric valve, malpighian tubules, ileum, colon, and rectum (Plate I, Fig. 1). This portion of the alimentary canal is 10 mm. in length.

The pyloric valve shows as a constriction in the region of the tract where the rows of papillae abruptly stop. It is just posterior to the attachment of the malpighian tubules.

There are six malpighian tubules, arising from the cephalic end of the ileum and extending forward, dorsally, ventrally, and laterally into the thoracic region; here they bend backward and extend posteriorly to the colon, entering this just underneath the "peritoneal" covering and passing to the end of the colon, where they suddenly disappear. These tubules are visible through the "peritoneal" membrane and are very much convoluted, so that the posterior portion of the colon is almost covered by them. (Plate I, Fig. 1.)

The ileum is a narrow thin-walled tube, located between the pyloric valve and the colon. The anterior end is convoluted and approximately the same diameter as the posterior end of the stomach. In some specimens there was a constriction between the ileum and colon due to the position of the food material in the tract, but usually the ileum is found to continue gradually into the colon without any line marking its posterior limit. The colon is a short straight tube leading to the rectum.

The alimentary tract narrows near the anus to form the heavily chitinized rectum. It is 2 mm. in length.

HISTOLOGICAL STRUCTURE OF THE ALIMENTARY CANAL.

Fore-Intestine.—The layers of the oesophagus, as shown by Plate I, Fig. 2, from the lumen outward are as follows: (1) Intima of cuticula of chitin. (2) Epithelium of hypodermal cells. (3) Basement membrane. (4) Longitudinal muscle. (5) Circular muscle, and (6) "peritoneal" membrane.

The intima is secreted by the hypodermal cells and is a non-cellular, thin layer of chitinous material, homologous with the cuticula of the body wall. In this region it has numerous minute, very short, chitinous spines extending into the lumen.

A single layer of epithelial cells which is in wave-like folds throughout the fore-intestine lies next to the intima. The cells have very large nuclei and the basement membrane is evident, though not conspicuous.

The longitudinal muscles are in scattered groups outside the epithelial layer.

A continuous layer of circular muscle fibers surrounds the longitudinal muscles, and numerous nuclei are scattered throughout the fibers.

There are traces of connective tissue ("peritoneal" membrane) on the outermost part of the oesophagus.

The oesophageal valve (Plate I, Figs. 3 and 4) lies at the junction of the fore- and mid-intestine. In this region numerous long crypts extend out from the wall of the digestive tract making a complete circle around it. This valve consists of a rather large fold of the fore-gut

extending into the lumen of the mid-gut. The intima disappears at the region where the folds of the fore-gut proceed anteriorly. A single crypt opening is also noted at this region, reaching outward at the place where the reflected surface of the mid-intestine joins the fore-intestine. (The dense ring of crypts is slightly farther back on the front end of the stomach.) The epithelial cells of the valve folds are quite large and have distinct, large nuclei. It is here that the reversal in position of the longitudinal and circular muscles occurs. The longitudinal muscles lie internal to the circular muscles in the fore-intestine and external to this layer in the mid-intestine.

Mid-Intestine.—The oesophageal valve lies at the anterior end of the mid-intestine, while the pyloric valve is its posterior limit. This is commonly called the stomach and anteriorly it is about twice the diameter of the posterior portion. It is in this region of the alimentary tract that the papillae are arranged in rows, six anterior and four posterior. See Plate I, Figs. 5 and 6, and Plate II, Fig. 7. Large globules of liquid are present in the lumen of the stomach, indicating merocrine secretion (Plate II, Fig. 8).

Histologically the layers of the anterior and posterior stomach are similar. From the lumen outward are noted the epithelial cells. The layer is one cell in thickness. The striated border resembling cilia is visible on some of these epithelial cells, although those cells which have globules of secreted material at their ends, show no such border. The basement membrane, at the base of the epithelial cells, is not very distinct. A rather thick circular muscle layer is next, and to the outside of this are scattered bundles of longitudinal muscle fibers. A thin "peritoneal" membrane is seen at places covering the longitudinal muscle cells. The nuclei in both the longitudinal and circular muscle layers are quite distinct. There is no intima in this region covering the epithelial cells. Two types of secretion are indicated here, merocrine and holocrine. Merocrine secretion is when the product is secreted by the cells, the latter not being destroyed, while holocrine secretion is when the entire substance of the cells is given up as a secretory product. It appears that holocrine secretion occurs in the long crypts which extend from the surface of the mid-intestine. (Plate I, Fig. 6, Plate II, Fig. 7.) Merocrine secretion takes place at first in the flat inner wall of the stomach, as the globules of secreted material in the lumen show. Later holocrine secretion probably occurs in the epithelial cells of the stomach wall for we find that the nuclei of the cells are very irregular in arrangement, the younger merocrine secreting cells having their nuclei at the base of the cells and the older (holocrine?) secreting cells have the nuclei almost at the end of the cell toward the lumen. (Plate II, Fig. 8.)

The crypts are rounded on the free ends or tips where they contain many nuclei. (Plate I, Fig. 6.) The tip is a nidus.

Hind-Intestine.—The junction of the mid- and hind-intestine is indicated externally by six malpighian tubules which are almost at the level of the last crypts. The tubules come from the hind-intestine and the walls are composed of irregularly shaped cells with large ovate nuclei. There is a lining of intima next to the lumen of the tubules. A delicate "peritoneal" membrane covers the tubules.

The pyloric valve lies just posterior to the attachment of the malpighian tubules. The epithelial cells here are thrown into folds and covered on the lumen side by a lining of intima. There is a thick layer of circular muscle fibers extending the length of the valve. On each side of the circular muscles are scattered groups of longitudinal muscle cells. The exterior layer of longitudinal muscles is almost absent in the region of the pyloric valve. The valvular condition is due to the very thick circular muscle layer at the region where the valve makes a bend. (Plate II, Figs. 9 and 10.)

The hind-intestine begins at the end of the pyloric valve and continues to the anus. The general arrangement of the cell layers is practically the same in the three regions of the hind-intestine, there being an inner lining of intima of cuticula, an epithelial layer, a circular muscle layer, and a longitudinal muscle layer. The intima and epithelial cells are thrown into many folds. (Plate II, Fig. 11.) The cells of the epithelial layer are large, rather cuboidal in shape, and possess very large nuclei located usually at the base of the cells. The circular muscle layer forms a continuous layer, while the longitudinal layer is composed of scattered groups of cells. These muscles are all striated.

A section of the colon (Plate II, Fig. 12) shows the continuous circular muscle layer dipping to touch the intima between the epithelial cells which are arranged in six groups. The longitudinal muscles are also in groups lying between the malpighian tubules. (Plate II, Fig. 13.)

The muscle wall of the rectum is very heavy and is made up largely of circular muscle tissue with a few groups of longitudinal muscle cells scattered near the surface. (Plate II, Fig. 14.) The epithelial cells are smaller than those in the more anterior part of the hind-intestine and they, with the intima, are folded into six distinct groups, known as the rectal pads.

The intima is much thicker here than in the colon. There is a "peritoneal" membrane in this region similar to that in other parts of the tract.

A pair of enlarged anal glands lie in the posterior abdominal region in front of and above the rectum. They are somewhat oval in shape, having a mushroom-shaped cap of secreting cells. Posterior to this cap is the thin-walled reservoir. The reservoirs of the right and left glands unite posteriorly and widen to form the excretory canal. The glands and reservoirs are yellowish in color, due to secreted material in them. According to Bordas (1899) the anal glands function as organs of defense; the yellow fluid secreted by them becomes volatile in contact with air and is of a pungent and acid nature. No histological study was made of these structures, but the manner of attachment of the cap to the reservoir and the connection of the gland to the outside are points quite worthy of further investigation.

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ABBREVIATIONS FOR PLATES.

AN. GL...Anal gland.
B. M.....Basement membrane.
C. M.....Circular muscle.
CR.....Crypt.
EPI.....Epithelium.
IL.....Ileum.
IN.....Intima.
L. M.....Longitudinal muscle.
LU.....Lumen.
MT.....Malpighian tubules.
N.....Nucleus.
NI.....Nidus.
OES.....Oesophagus.
OES. V...Oesophageal valve.
PTL. M...Peritoneal membrane.
P. V.....Pyloric valve.
RE.....Rectum.
R. P.....Rectal pad.
ST.....Stomach.
VAL.....Valve.

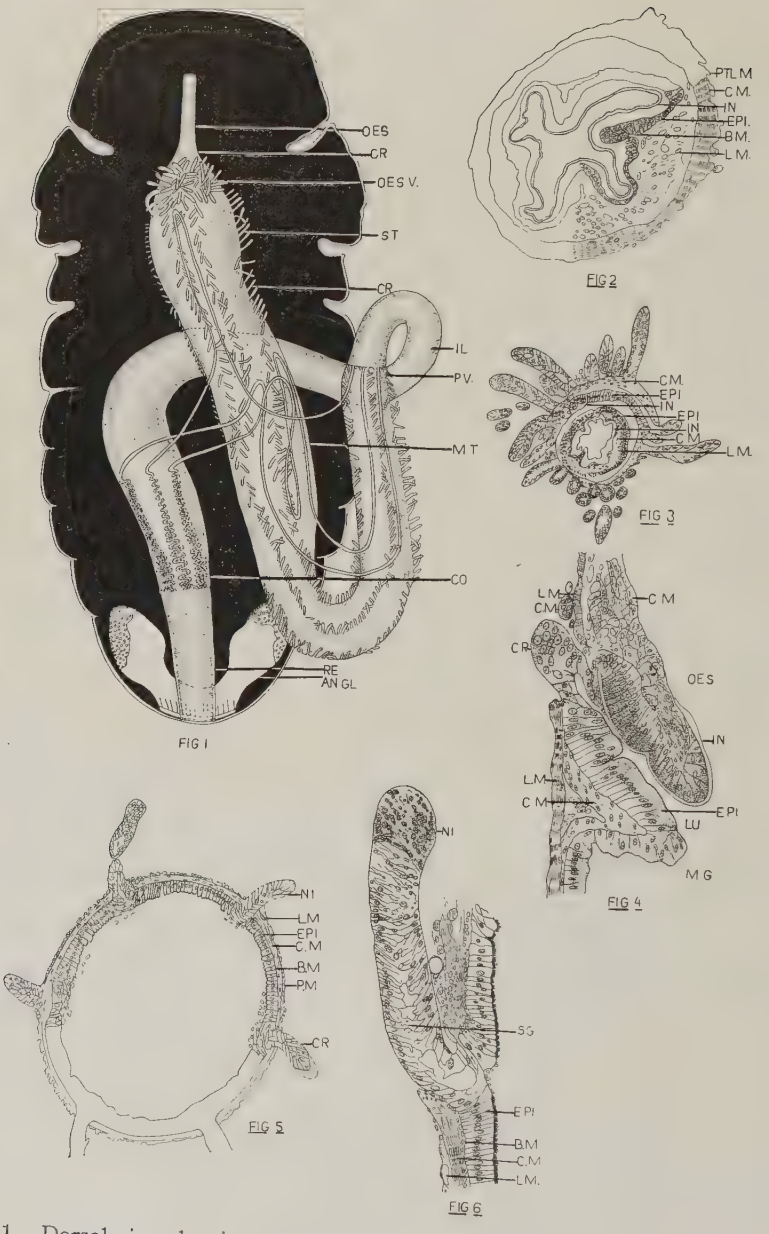

Fig. 1. Dorsal view showing gross dissection of the Alimentary Canal.
Fig. 2. Cross-section through Oesophagus.
Fig. 3. Cross-section through Oesophageal Valve.
Fig. 4. Longitudinal section through Oesophageal Valve.
Fig. 5. Cross-section through anterior mid-gut showing six Crypts.
Fig. 6. Cross-section through anterior mid-gut and a longitudinal section of a crypt (enlarged).

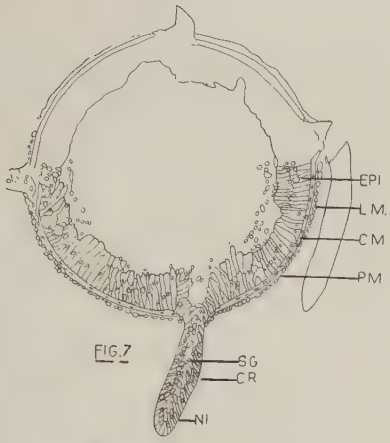

FIG. 7

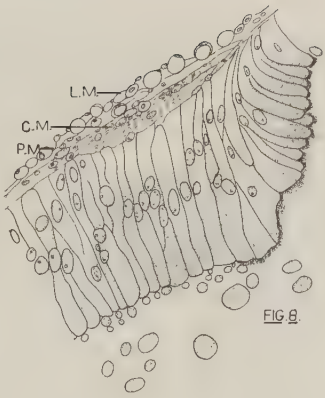

FIG. 8.

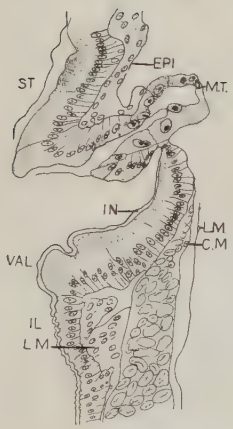

FIG. 9

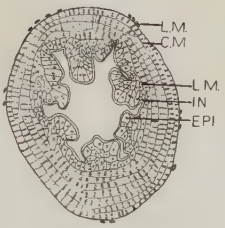

FIG. 10.

FIG. 11

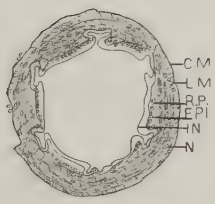

FIG. 14

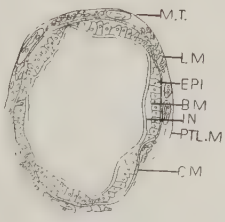

FIG. 12

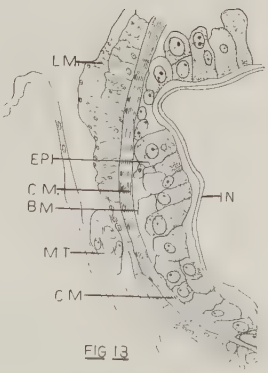

FIG. 13

Fig. 7. Cross-section through posterior mid-gut showing four crypts.
Fig. 8. Enlarged drawing of portion of Fig. 7.
Fig. 9. Longitudinal section showing the pyloric valve.
Fig. 10. Cross-section through the pyloric valve.
Fig. 11. Cross-section through the ileum.
Fig. 12. Cross-section through the colon.
Fig. 13. Detailed drawing of portion of Fig. 12.
Fig. 14. Cross-section through rectum.

ADDITIONS TO THE REVISED CATALOG OF OHIO VASCULAR PLANTS. I.*

JOHN H. SCHAFFNER.

The publication of a new catalog of Ohio vascular plants† in the spring of 1932 has apparently stimulated collectors to more intensive activity and in consequence a very large number of specimens have been received for the State Herbarium. Only the most important additions are given in the list below and of these 41 are entirely new to the state catalog. Several records have also been obtained of species in the published list which were not represented by any specimen in the herbarium. Typographical errors appear in two distribution records in the new catalog and should be corrected as follows: 2160. *Aster novae-angliae* L., read—General and abundant; 1132. *Geum strictum* Ait., read—Northeastern part of state; etc., instead of Northwestern. New records are inserted in the proper places by means of decimal numbers.

SCHIZAEACEAE. Climbing-fern Family.

10.1. *Lygodium palmatum* (Bern.) Sw. Climbing-fern. Pine Forest, Carbondale, Athens Co. Elizabeth E. Inmann. Same locality, Floyd B. Chapman.

12. *Polypodium polypodioides* (L.) Hitch. Gray Polypody. Rocky Fork, Highland Co. Leslie L. Pontius and Floyd Bartley.

47. *Pteretis nodulosa* (Mx.) Nieuwl. American Ostrich-fern. Common along roadside, Windsor Twp., Ashtabula Co. L. E. Hicks.

60. *Equisetum silvaticum* L. Wood Horsetail. Nelson Twp., N. E. Portage Co. R. J. Campbell.

63. *Lycopodium porophilum* Lloyd & Und. Rock Club-moss. Phelps Run, Ashtabula Co. L. E. Hicks.

64. *Lycopodium inundatum* L. Bog Club-moss. Bottom of abandoned stone quarry. Braceville Twp., Trumbull Co. Almon N. Rood.

66.1. *Lycopodium tristachyum* Pursh. Slender Trailing Club-moss. On edge of very dry bank along Conneaut River near Conneaut, Ashtabula Co. L. E. Hicks.

68. *Selaginella rupestris* (L.) Spring. Rock Selaginella. Newell Ledge, Nelson Twp., Portage Co. Almon N. Rood, R. J. Webb, and E. W. Vickers.

BUTOMACEAE. Flowering-rush Family.

87.1. *Butomus umbellatus* L. Flowering-rush. Little Cedar Point, Jerusalem Twp., Lucas Co. From Europe. Louis W. Campbell.

93. *Potamogeton pulcher* Tuck. Spotted Pondweed. South of Cardinal Lake, Ashtabula Co. L. E. Hicks.

101. *Potamogeton perfoliatus* L. Clasping-leaf Pondweed. On beach at Sweden and East Ashtabula, Ashtabula Co. L. E. Hicks.

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*Papers from the Department of Botany, The Ohio State University, No. 319.

†SCHAFFNER, JOHN H. Revised Catalog of Ohio Vascular Plants. Ohio Biol. Surv. *5* (2): 87–215. 1932. (Bull. No. 25).

106. *Potamogeton vaseyi* Robb. Vasey's Pondweed. Small pond along Conneaut River near Farnham, Ashtabula Co. L. E. Hicks.
108. *Potamogeton dimorphus* Raf. Spiral Pondweed. In pond at McArthur, Vinton Co. L. E. Hicks.
112.1. *Naias quadalulpensis* (Spreng.) Mor. Guadaloupe Naias. Abundant in streams in Williamsfield Twp., Ashtabula Co. L. E. Hicks.
118. *Castalia tuberosa* (Paine) Greene. Tuberous Water-lily. Near East Tiberly, Summit Co., mouth of Conneaut River and pond along Ashtabula River., Ashtabula Co. L. E. Hicks.
122. *Sparganium androcladum* (Engelm.) Morong. Branching Bur-reed. Rock Run, Liberty Twp., Jackson Co. Leslie L. Pontius and Floyd Bartley.
138.1. *Wolffia papulifera* Thomp. Pointed Wolffia. In a small pool, Salt Creek, Liberty Twp., near Coal Twp., Jackson Co. Robert B. Gordon.
142. *Scirpus sylvaticus* L. Wood Bulrush. Swampy ground. Richland Co. E. Wilkinson.
145.1. *Scirpus heterochaetus* Chase. Pale Great Bulrush. In a swamp. Mantua Twp., Portage Co. Almon N. Rood.
149. *Scirpus debilis* Pursh. Weak Clubrush. Painesville, Lake Co. Wm. C. Werner.
152. *Eriophorum viridicarinatum* (Engelm.) Fern. Thin-leaf Cotton-sedge. Painesville, Lake Co. Wm. C. Werner.
160. *Eleocharis intermedia* (Muhl.) Schultes. Matted Spike-rush. Columbus, Franklin Co. Wm. C. Werner.
172. *Cyperus speciosus* Vahl. Michaux's Cyperus. Painesville, Lake Co. Wm. C. Werner.
187. *Mariscus mariscoides* (Muhl.) Ktz. Twig-rush. Cedar Swamp, Champaign Co. Wm. C. Werner. Mantua Twp., Portage Co., Almon N. Rood.
189. *Scleria triglomerata* Mx. Tall Nut-rush. Nettle Lake, Williams Co. Floyd Bartley and Leslie L. Pontius.
200. *Carex plana* Mack. Painesville, Lake Co. Wm. C. Werner.
212. *Carex prarea* Dew. Prairie Sedge. Painesville, Lake Co. Wm. C. Werner.
216. *Carex crus-corvi* Shuttlw. Raven-foot Sedge. Wood Co. Albert Neifer and Wm. C. Werner; Scioto Twp., Ross Co. Floyd Bartley and Leslie L. Pontius.
222. *Carex interior* Bail. Inland Sedge. Painesville, Lake Co. Wm. C. Werner.
223. *Carex sterilis* Willd. Barren Sedge. Cedar Swamp, Champaign Co. Wm. C. Werner.
230.1. *Carex projecta* Mack. Necklace Sedge. Painesville, Lake Co. Dr. H. C. Beardslee (1879). Sent in by Mr. Wm. C. Werner.
242. *Carex foena* Willd. Hay Sedge. Painesville, Lake Co. Wm. C. Werner.
249. *Carex gynandra* Schw. Nodding Sedge. Buchtel, Athens Co. Len. Stephenson.
303. *Carex atherodes* Spreng. Awned Sedge. "Onion Island," Buckeye Lake, Fairfield Co. Edward S. Thomas.
304.1. *Carex viridula* Mx. Green Sedge. (*C. oederi pumila* (C. & G.) Fern.) Cedar Swamp, Champaign Co. Wm. C. Werner.
305. *Carex cryptolepis* Mack. Small Yellow Sedge. Mantua Twp., Portage Co. Almon N. Rood and R. J. Webb.
306. *Carex flava* L. Yellow Sedge. Cedar Swamp, Champaign Co. Wm. C. Werner. "Urbana Bog," Champaign Co. E. Lucy Braun.
333.1. *Bromus altissimus* Pursh. Tall Brome-grass. Braceville Twp., Trumbull Co. Almon N. Rood. Painesville, Lake Co. Wm. C. Werner.
334.1. *Bromus asper* Murr. Rough Brome-grass. Daleyville, Pike Co. Leslie L. Pontius and Floyd Bartley.
410.1. *Alopecurus myosuroides* Huds. Slender Foxtail. Accidental. A number of clumps on Ohio State University Farm. Columbus, Franklin Co. C. J. Willard.
413. *Alopecurus aristatulus* Mx. Short-awned Foxtail. Near Columbus, Franklin Co., Wm. C. Werner; Cedar Swamp, Champaign Co., John H. Schaffner.

430. *Aristida purpurascens* Poir. Purplish Triple-awn-grass. Liberty Twp., Highland Co. Katie M. Roads.
508. *Paspalum setaceum* Mx. Slender Paspalum. Liberty Twp., Ross Co. Floyd Bartley and Leslie L. Pontius.
508.1. *Paspalum pubescens* Muhl. Pubescent Paspalum. Plentiful in fields near Painesville, Lake Co. Identified by A. S. Hitchcock. Wm. C. Werner.
517. *Miscanthus sinensis* Anderss. Chinese Plume-grass. A large well established patch along bank of railway. Brush Creek Twp., Scioto Co. Katie M. Roads; Longstreth, Hocking Co. Len. Stephenson.
547. *Aletris farinosa* L. Colic-root. Colerain Twp., Ross Co.; Jackson Twp., Vinton Co.; near Nettle Lake, Williams Co. Leslie L. Pontius and Floyd Bartley.
554. *Triantha glutinosa* (Mx.) Baker. Glutinous Triantha. Paxton Twp., Ross Co. Floyd Bartley and Leslie L. Pontius.
594. *Juncus balticus* Willd. Baltic Rush. Bay Point, Ottawa Co., and Conneaut, Ashtabula Co. L. E. Hicks.
599.1. *Juncus greenei* Oakes and Tuck. Green's Rush. Abundant in low, wet swale. Phalanx, Trumbull Co. Almon N. Rood.
614. *Xyris flexuosa* Muhl. Slender Yellow-eyed-grass. Wood Co. Albert Kneifer. Sent by Wm. C. Werner.
647. *Blephariglottis blephariglottis* (Willd.) Rydb. White Fringed-orchis. East Andover Twp., Ashtabula Co. L. E. Hicks.
656. *Ibidium strictum* (Rydb.) House. Hooded Lady's-tresses. Goodhope Twp., Hocking Co. Floyd B. Chapman.
659. *Ibidium beckii* (Lindl.) House. Little Lady's-tresses. Farnham, Ashtabula Co. L. E. Hicks. Buchtel, Athens Co. Len. Stephenson.
660.1. *Peramium tesselatum* (Lodd.) Heller. Loddiges' Rattlesnake-plantain. (*Epipactis tesselata* (Lodd.) A. A. Eat.). Along Phelps Run, Ashtabula Co. L. E. Hicks.
686. *Ranunculus bulbosus* L. Bulbous Buttercup. Ashtabula, Ashtabula Co. L. E. Hicks.
688. *Ranunculus repens* L. Creeping Buttercup. New Castle Twp., Coshocton Co. Frank B. Selby.
688a. *Ranunculus repens pleniflorus* Fern. Double-flowered Creeping Buttercup. Geneva, Ashtabula Co. L. E. Hicks.
694. *Ranunculus pusillus* Poir. Dwarf Crowfoot. East Monroe Twp., Ashtabula Co. L. E. Hicks.
701. *Nigella damascena* L. Love-in-a-mist. In a pasture lot. Hillsboro, Highland Co. Katie M. Roads.
705.1. *Delphinium cultorum* Voss. Candle Larkspur. Persistent in Conneaut, Ashtabula Co. L. E. Hicks.
707. *Delphinium exaltatum* Ait. Fall Larkspur. Persistent at Ashtabula, Ashtabula Co. L. E. Hicks.
721. *Actaea rubra* (Ait.) Willd. Red Baneberry. Springfield and Jerusalem Twps., Lucas Co. Louis W. Campbell; Wayne Twp., Ashtabula Co. L. E. Hicks. Clifton Gorge, Greene Co. Arthur R. Harper.
760. *Fumaria officinalis* L. Common Fumitory. Kingsville, Ashtabula Co. L. E. Hicks.
768. *Lunaria annua* L. Honesty. Green Twp., Ross Co. Floyd Bartley and Leslie L. Pontius.
791.1. *Sophia sophia* (L.) Britt. Herb-Sophia. In a pasture lot. Hillsboro, Highland Co. Katie M. Roads.
798. *Norta irio* (L.) Britt. Longleaf Hedge-mustard. Along railroad embankment, Marion Co. F. B. Chapman.
837. *Brassica napus* L. Rape. Hillsboro, Highland Co. Katie M. Roads.
850. *Geranium columbinum* L. Long-stalked Crane's-bill. Jackson Twp., Jackson Co. Leslie L. Pontius and Floyd Bartley.
853. *Geranium pusillum* L. Small-flowered Crane's-bill. Green Twp., Ross Co. Leslie L. Pontius and Floyd Bartley.
855. *Erodium cicutarium* (L.) L'Her. Stork's-bill. In a field of crimson clover, Hillsboro, Highland Co. Katie M. Roads.
862. *Oxalis acetosella* L. White Wood-sorrel. Pymatuning Swamp, Ashtabula Co. L. E. Hicks.

864. *Linum perenne* L. Perennial Flax. Persistent along river at Conneaut, Ashtabula Co. L. E. Hicks.
867. *Linum striatum* Walt. Ridged Flax. Jackson Twp., Jackson Co. Leslie L. Pontius and Floyd Bartley; Andover, Ashtabula Co. L. E. Hicks.
876. *Zanthoxylum americanum* Mill. Prickly-ash. Windsor Twp., Ashtabula Co. L. E. Hicks.
879. *Polygala paucĭflora* Willd. Fringed Milkwort. Margin of white pine woods, Farnham, Ashtabula Co. L. E. Hicks.
887. *Phyllanthus carolinensis* Walt. Carolina Phyllanthus. Liberty Twp., Ross Co. Leslie L. Pontius and Floyd Bartley.
917.1. *Malva verticillata* L. Whorled Mallow. In a pasture lot in Hillsboro, Highland Co. Katie M. Roads.
947. *Hypericum canadense* L. Canadian St. John's-wort. Conneaut, Ashtabula Co. L. E. Hicks.
950.1. *Triadenum longifolium* Small. Long-leaf Marsh St. John's-wort. Liberty Twp., Jackson Co. Floyd Bartley and Leslie L. Pontius.
953. *Crocanthemum canadense* (L.) Britt. Canada Frostweed. Abundant on river banks in East Conneaut, Ashtabula Co. L. E. Hicks.
956. *Lechea racemulosa* Lam. Oblong-fruited Pinweed. One mile south of Portage, Wood Co., and near Conneaut, Ashtabula Co. L. E. Hicks.
960. *Lechea leggettii* Britt. & Holl. Leggett's Pinweed. Portage, Wood Co., Liberty Twp., Ross Co. Floyd Bartley and Leslie L. Pontius.
961. *Lechea intermedia* Legg. Large-podded Pinweed. Dry upland pasture. Hanover Twp., Ashland Co. R. B. Gordon.
972. *Viola tricolor* L. Garden Pansy. Escaped along river at Conneaut, Ashtabula Co. L. E. Hicks.
979. *Viola affinis* LeC. Thinleaf Blue Violet. Liberty Twp., Ross Co. Leslie L. Pontius and Floyd Bartley.
998. *Moehringia lateriflora* (L.) Fenzl. Bluntleaf Moehringia. Conneaut, Ashtabula Co. L. E. Hicks.
1000. *Alsine aquatica* (L.) Britt. Water Chickweed. Painesville, Lake Co. Wm. C. Werner. In small pond near Saybrook, Ashtabula Co. L. E. Hicks.
1002. *Alsine pubera* (Mx.) Britt. Great Chickweed. Near Geneva, Ashtabula Co. L. E. Hicks.
1006. *Cerastium viscosum* L. Mouse-ear Chickweed. Liberty Twp., Ross Co. Floyd Bartley and Leslie L. Pontius.
1011. *Spergula arvensis* L. Corn Spurry. Four miles east of Barnesville, Belmont Co. Emma E. Laughlin and Edward Ransom. Growing along fence-row near Saybrook, Ashtabula Co. L. E. Hicks.
1028. *Silene wherryi* Small. Wherry's Catchfly. Bourneville, Ross Co. and in Adams Co. near Scioto Co. line. Katie M. Roads.
1037. *Dianthus prolifer* L. Proliferous Pink. Dry fields, Cleveland, Cuyahoga Co. L. D. Stair. Lost specimen recovered.
1039. *Limnia perfoliata* (Donn) Haw. Spanish-lettuce. Painesville, Lake Co. Wm. C. Werner.
1049. *Scleranthus annuus* L. Knawel. Near Beallsville, Monroe Co. Harry Briggs.
1063. *Chenopodium vulvaria* L. Fetid Goosefoot. Circleville, Pickaway Co. Leslie L. Pontius and Floyd Bartley; Napoleon, Henry Co. E. H. Bond.
1104.1. *Tiniaria cilinodis* (Mx.) Small. Fringed Black Bindweed. Conneaut River west of Farnham, Ashtabula Co. L. E. Hicks.
1132. *Geum strictum* Ait. Yellow avens. Nettle Lake, Williams Co. Leslie L. Pontius and Floyd Bartley.
1144.1. *Duchesnea indica* (Andr.) Focke. Indian Strawberry. Introduced from Eurasia. Growing on shaded banks near the lake shore east of Ashtabula, Ashtabula Co. L. E. Hicks; Circleville Twp., Pickaway Co. Leslie L. Pontius and Floyd Bartley.
1149. *Rubus phoenicolasius* Max. Wineberry. Common in a ravine along Lake Erie, near Amboy, Ashtabula Co. L. E. Hicks.
1149.1. *Rubus idaeus* L. Red Raspberry. From Europe. Escaped near Amboy, Ashtabula Co. L. E. Hicks.
1153. *Rubus laciniatus* Willd. Cutleaf Blackberry. Near mouth of Conneaut River, Ashtabula Co. L. E. Hicks.

1164.1. *Spiraea latifolia* (Ait.) Borkh. American Meadow-sweet. Near Painesville, Lake Co. Wm. C. Werner.
1167. *Spiraea prunifolia* Sieb. & Zucc. Bridal-wreath (Spiraea). Escaped near Colebrook, Ashtabula Co. L. E. Hicks.
1170.1. *Rosa wichuraiana* Crep. White Dorothy Perkins variety of this. Long persistent and spreading about the site of a former dwelling. South Windsor Twp., Ashtabula Co. Original from Japan. L. E. Hicks.
1175.1. *Rosa cinnamomea* L. Cinnamon Rose. A common escape. Windsor Twp., Ashtabula Co. L. E. Hicks.
1176. *Rosa rugosa* Thunb. Japanese Rose. Escaped on high beach dunes at Geneva-on-the-Lake, Ashtabula Co. L. E. Hicks.
1182. *Agrimonia striata* L. Striate Agrimony. East Monroe Twp., Ashtabula Co. L. E. Hicks.
1189. *Prunus pennsylvanica* L. f. Red Cherry. East Monroe Twp., Ashtabula Co. L. E. Hicks.
1214. *Crataegus brainerdi* Sarg. Brainerd's Hawthorn. Farmington Twp., Trumbull Co. Almon N. Rood.
1254. *Trifolium reflexum* L. Buffalo Clover. Ashtabula Twp., Ashtabula Co. L. E. Hicks.
1264.1. *Wisteria frutescens* (L.) Poir. American Wisteria. (*Kraunhia frutescens* (L.) Greene.) Escaped and long persistent near former dwelling site near Phelps Run, Ashtabula Co. L. E. Hicks.
1285. *Meibomia arenicola* Vail. Sand Tick-trefoil. Perkins, Erie Co. E. L. Moseley.
1321. *Galacta volubilis* (L.) Britt. Downy Milk-pea. Liberty Twp., Jackson Co. Leslie L. Pontius and Floyd Bartley.
1322. *Phaseolus polystachyus* (L.) B. S. P. Wild Bean. Brush Creek Twp., Highland Co.; Colerain Twp., Ross Co. Floyd Bartley and Leslie L. Pontius.
1352. *Rhamnus caroliniana* Walt. Carolina Buckthorn. Adams Co., two miles from Brown Co. line and about fifteen miles north of the Ohio River. Mrs. W. L. Hughes.
1353. *Rhamnus frangula* L. Black Buckthorn. Bucyrus, Crawford Co. Volunteer or accidental. J. H. Ulmer.
1359.1. *Vitis labruscana* Bail. Labruscan Vineyard Grape. A white berried cultivated variety frequently escaped and persistent at Hartsgrove, Ashtabula Co. L. E. Hicks. Seedlings from Concord Grape escaped and persistent in Columbus, Franklin Co. John H. Schaffner.
1436.1. *Corylus rostrata* Ait. Beaked Hazelnut. Along Grand River near Harpersfield, Ashtabula Co. L. E. Hicks.
1472a. *Salix interior wheeleri* Rowlee. Ashtabula Beach, Ashtabula Co. L. E. Hicks.
1490.1. *Ribes glandulosum* Grauer. Fetid Current. East Monroe Twp., Ashtabula Co. L. E. Hicks.
1501.1. *Epilobium hirsutum* L. Great Hairy Willow-herb. Swamp near Conneaut, Ashtabula Co. L. E. Hicks.
1509. *Kneiffia pratensis* Small. Meadow Sundrops. Near Geneva-on-the-Lake, Ashtabula Co. L. E. Hicks.
1513. *Kneiffia longipedicellata* Small. Long-pedicelled Sundrops. Liberty Twp., Ross Co. Floyd Bartley and Leslie L. Pontius.
1523. *Myriophyllum heterophyllum* Mx. Variant-leaf Water-milfoil. Marsh at Geneva-on-the-Lake, Ashtabula Co. L. E. Hicks.
1529. *Citrullus citrullus* (L.) Karst. Watermelon. Spontaneous along East Conneaut Road, Ashtabula Co. L. E. Hicks.
1538. *Ledum groenlandicum* Oedr. Labrador-tea. East Andover Twp., Ashtabula Co. L. E. Hicks.
1539.1. *Azalea canescens* Mx. Hoary Azalea. "In a muck area now destroyed," near Painesville, Lake Co. Wm. C. Werner; Phelps Creek, Ashtabula Co. L. E. Hicks.
1543. *Epigaea repens* L. Trailing Arbutus. Laurel Hill, near White Cottage, Muskingum Co. Jeanette A. Reed.
1563. *Vaccinium canadense* Kahn. Canada Blueberry. East Andover Twp., Ashtabula Co. L. E. Hicks.

1564. *Chiogenes hispidula* (L.) T. & G. Creeping Snowberry. East Andover Twp., Ashtabula Co. L. E. Hicks.

1570.1. *Polemonium coeruleum* L. Jacobs-ladder. Long-persistent about the site of a former dwelling in Windsor Twp., Ashtabula Co. L. E. Hicks.

1577. *Phlox ovata* L. Mountain Phlox. Highland Co. Reported by Edgar T. Wherry. Bartonia 13: 27. 1931.

1577a. *Phlox ovata carolina* (L.) Wherry. Near Cincinnati, Hamilton Co. (Lea Herbarium, Acad. Nat. Sci. Philadelphia), collected in 1839. Adams Co. (E. Lucy Braun Herb.)

1650. *Asclepias variegata* L. White Milkweed. Georgesville, Franklin Co. Wm. C. Werner.

1661. *Datura metel* L. Entire-leaf Jinson-weed. Napoleon, Henry Co. E. H. Bond.

1710. *Aureolaria laevigata* (Raf.) Raf. Entire-leaf False Foxglove. Below Harpersfield, Ashtabula Co. L. E. Hicks.

1737. *Antirrhinum majus* L. Great Snapdragon. Escaped near Geneva, Ashtabula Co. L. E. Hicks.

1746. *Paulownia tomentosa* (Thunb.) Baill. Paulownia. Near Buena Vista in both Adams and Scioto Cos. L. E. Hicks.

1759. *Stomoisia cornuta* (Mx.) Raf. Horned Bladderwort. Cedar Swamp, Champaign Co., near Bowlusville. Wm. C. Werner.

1769.1. *Cynoglossum boreale* Fern. Northern Wild Confrey. East Monroe Twp., Ashtabula Co. L. E. Hicks.

1774. *Lithospermum carolinense* (Walt.) Mack. Hairy Puccoon. East Conneaut Beach, Ashtabula Co. L. E. Hicks.

1780. *Myosotis micrantha* Pall. Small-flowered Forget-me-not. Near Painesville, Lake Co. Wm. C. Werner.

1781.1. *Anchusa officinalis* L. Alkanet. Introduced near Painesville, Lake Co. W. C. Werner.

1782.1. *Symphytum asperimum* Donn. Rough Comfrey. Introduced near Painesville, Lake Co. Wm. C. Werner.

1785. *Lycopsis arvensis* L. Small Bugloss. Escaped near Austinburg, Ashtabula Co. L. E. Hicks; Painesville, Lake Co. Wm. C. Werner.

1792. *Verbena hybrida* Voss. Common Garden Verbena. Escaped near Saybrook, Ashtabula Co. L. E. Hicks.

1796.1. *Ajuga reptans* L. Creeping Bugleweed. Spontaneous at Painesville, Lake Co. Wm. C. Werner.

1805. *Scutellaria pilosa* L. Hairy Skullcap. Benton Twp., Hocking Co. Floyd Bartley and Leslie L. Pontius.

1814. *Mentha citrata* Ehrh. Bergamot Mint. Buchtel, Athens Co. Len. Stephenson.

1831. *Koellia pycnanthemoides* (Leav.) Ktz. Southern Mountain-mint. Liberty Twp., Jackson Co. Floyd Bartley and Leslie L. Pontius.

1841. *Hedeoma hispida* Pursh. Rough Pennyroyal. Oak Openings, Lucas Co. Floyd Bartley and Leslie L. Pontius.

1872. *Salvia pitcheri* Torr. Wild Blue Sage. Persistent after cultivation. Hillsboro, Highland Co. Katie M. Roads.

1892. *Hydrocotyle umbellata* L. Umbellate Marsh-pennywort. Conneaut River, Ashtabula Co. L. E. Hicks.

1942. *Cynoxylon canadense* (L.) Dwarf Dogwood. Near Streetsboro, Portage Co. Leslie L. Pontius and Floyd Bartley; Painesville, Lake Co. Wm. C. Werner.

1954.1. *Diodia virginiana* L. Virginia Buttonweed. Along the Ohio River shore, Adams Co. Conrad Roth.

1955. *Galium verum* L. Yellow Bedstraw. Hillsboro, Highland Co. Katie M. Roads.

1956. *Galium boreale* L. Northern Bedstraw. E. Monroe Twp., Ashtabula Co. L. E. Hicks.

1985. *Triosteum aurantiacum* Bickn. Scarlet-fruited Horse-gentian. Buchtel, Athens Co. Len. Stephenson.

1991.1. *Lonicera coerulea* L. Blue Fly Honeysuckle. Pymatuning Swamp, Ashtabula Co. L. E. Hicks.

1994. *Lonicera sempervirens* L. Trumpet Honeysuckle. South of Oak Hill, Jackson Co. Floyd Bartley and Leslie L. Pontius.

2027.1. *Ambrosia bidentata* Mx. Lanceleaf Ragweed. Dean Forest, Lawrence Co. From the West. Floyd Bartley and Leslie L. Pontius.
2039a. *Rudbeckia laciniata hortensia* Bail. Golden-glow. Escaped in East Pierpoint Twp., Ashtabula Co. L. E. Hicks.
2050. *Helianthus instabilis* Wats. Unstable Sunflower. Dorset, Ashtabula Co. L. E. Hicks.
2081. *Megalodonta beckii* (Torr.) Greene. Water-marigold. Conneaut Harbor, Ashtabula Co. L. E. Hicks.
2082. *Coreopsis lanceolata* L. Lanceleaf Tickseed. Hillsboro, Highland Co. Katie M. Roads; West Alexandria, Preble Co. L. E. Hicks.
2095. *Silphium terebinthinaceum pinnatifidum* (Ell.) Gr. Wayne Twp., Pickaway Co. Leslie L. Pontius and Floyd Bartley.
2101. *Tagetes erecta* L. Large Marigold. Escaped at Conneaut, Ashtabula Co. L. E. Hicks.
2117. *Chrysopsis gramnifolia* (Mx.) Ell. Grass-leaf Golden-aster. Lynx Prairie, Adams Co. L. E. Hicks.
2136. *Solidago neglecta* T. & G. Swamp Goldenrod. Green Twp., Ross Co. Leslie L. Pontius and Floyd Bartley.
2146. *Sericocarpus linifolius* (L.) B. S. P. Narrowleaf Whitetop Aster. Liberty Twp., Jackson Co. Leslie L. Pontius and Floyd Bartley.
2156. *Aster drummondii* Lindl. Drummond's Aster. Georgesville, Franklin Co. Wm. C. Werner.
2157. *Aster undulatus* L. Wavy-leaf Aster. Buffalo Beat, near Buchtel, Athens Co. L. E. Hicks and E. S. Thomas.
2161. *Aster patens* Ait. Late Purple Aster. Georgesville, Franklin Co. Wm. C. Werner.
2170. *Aster multiflorus* Ait. Dense-flowered Aster. Painesville, Lake Co. Wm. C. Werner.
2172. *Aster salicifolius* Lam. Willow Aster. Painesville, Lake Co.; Columbus, Franklin Co. Wm. C. Werner.
2176.1. *Aster acumniatus* Mx. Whorled Aster. East Monroe Twp., Ashtabula Co. L. E. Hicks.
2177.1. *Aster subulatus* Mx. Annual Saltmarsh Aster. On sandy, saline soil near oil wells, old lake beach, five miles south of Bowling Green, Wood Co. E. L. Moseley.
2218. *Matricaria chamomilla* L. German Chamomile. Painesville, Lake Co. and Hanging Rock, Lawrence Co. Wm. C. Werner.
2229.1. *Senecio sylvaticus* L. Wood Groundsel. From Europe. Painesville, Lake Co. Wm. C. Werner.
2250. *Cirsium odoratum* (Muhl.) Britt. Fragrant Thistle. On sand ridge south east of Conneaut, Ashtabula Co. L. E. Hicks.
2255. *Centaurea jacea* L. Brown Star-thistle. N. E. corner Bazetta Twp., Trumbull Co. R. J. Campbell. On bank of Penn Line Bog, Ashtabula Co. L. E. Hicks; Columbus, Franklin Co. and Mentor, Lake Co. Wm. C. Werner.
2258. *Centaurea vochinensis* Bernh. Tyrol Star-thistle. South of Ashtabula, Ashtabula Co. L. E. Hicks.
2270. *Apargia autumnalis* (L.) Hoffm. Fall Hawkbit. Painesville, Lake Co. Wm. C. Werner.
2297. *Sonchus uliginosus* Bieb. Glandless Field Sow-thistle. South of Kenton, Hardin Co. Leslie L. Pontius and Floyd Bartley.

The Background of Science.

In an early chapter of this stimulating and fundamental discussion of physical science Sir James Jeans says, "It is frequently more difficult to frame a sensible question than to obtain an answer to a nonsensical one." The book is largely given over to the framing of sensible basic questions to be asked of nature, and to nature's replies to these questions. The discussion is necessarily technical, but it is made extremely readable by the wealth of clear analogies presented. The book is the last word on the basic framework of science.—L. H. S.

The New Background of Science, by Sir James Jeans. viii + 301 pp. New York, the MacMillan Co., 1933.